

PISA2009



PISA2009

Our 21st century learners at age 15

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An Overview of PISA

What is PISA?

The Programme for International Student Assessment (PISA) is an international standardised study that assesses and compares how well countries are preparing their 15-year-old¹ students to meet real-life opportunities and challenges.

What does PISA assess?

PISA assesses three key areas of knowledge and skills – reading literacy, mathematical literacy and scientific literacy – and has a focus on one of these literacy areas each time PISA is administered. The focus of PISA 2009 is reading. In each country students complete a two hour test booklet in the language of their instruction.² The term ‘literacy’ is used to emphasise that the assessment is not restricted to assessing how well students, have mastered the content of a specific school curriculum. Instead, PISA focuses on assessing students’ ability to apply their knowledge and skills, and their ability to make decisions in real-life situations as they near the end of their compulsory schooling. PISA defines this approach as assessing the “things that 15-year-old students will need in the future and ... what they can do with what they have learned – reflecting the ability of students to continue learning throughout their lives by applying what they learn in school to non-school environments, evaluating their choices and making decisions.”³

What additional information is gathered?

Background information is also gained in each PISA cycle from questionnaires completed by students and school principals. In addition, in PISA 2009 parents completed a questionnaire. These questionnaires allow for the relationship between contextual information and achievement to be examined.

How often is PISA administered?

PISA is administered every three years, beginning in 2000. Reading was the main focus in the first cycle. In 2003 the focus was mathematical literacy, in 2006 the focus was scientific literacy and in 2009 it was reading literacy again. Rotating the main focus for each administration of PISA provides in-depth and detailed information on the subject of main focus along with an ongoing source of achievement data on the two minor subjects.

Who participates in PISA?

Around 470,000 15-year-old students from 65⁴ countries or economies, including the 34 Organisation for Economic Co-operation and Development (OECD) member countries, participated in PISA 2009. In New Zealand 4,643 students from 163 schools took part. Students and schools were randomly selected. A two-tiered stratified sampling method was used to ensure the sample was representative. Schools were randomly selected based on the following characteristics: size, decile, location (urban or rural), authority (state or independent) and

type (co-educational or single-sex). As a result, every 15-year-old had roughly the same chance of selection.

Why participate in PISA?

PISA assesses students who have completed around 10 years of compulsory schooling, which means the PISA results are an important source of information in New Zealand. PISA measures progress towards the Government’s goals of:

- building a world-leading education system that equips all New Zealanders with the knowledge, skills and values to be successful citizens in the 21st century,
- reducing systemic underachievement in education, and
- driving the improvement of educational performance across New Zealand’s education system to improve education outcomes for all young New Zealanders.

PISA not only allows measurement of New Zealand’s progress on these goals over time, but also allows measurement of New Zealand’s performance relative to other countries in equipping students with skills and reducing disparities in achievement. The PISA data contributes to the evidence to shape the direction of teaching and learning in schools, focus on quality and effective teaching making our world-class education system even better.

Who organises PISA?

PISA is an initiative of the OECD and a collaborative effort of the participating countries. Two consortia were responsible for developing and overseeing PISA 2009 at the international level. The consortium responsible for development of the cognitive assessment and the implementation of the study was led by the Australian Council for Educational Research (ACER), and included Westat (USA), The National Institute for Educational Research in Japan, cApStAn Linguistic Quality Control, (Belgium), Unité d’analyse des systèmes et des pratiques d’enseignement (aSPe, Belgium) and the Deutsches Institut für Internationale Pädagogische Forschung (DIPF, Germany). CITO Institute for Educational Measurement (Netherlands) led the consortium responsible for the development of the questionnaires and included the University of Twente (Netherlands), the University of Jyväskylä’s Institute for Educational Research (Finland) and the Direction de l’Evaluation de la Prospective et de la Performance (DEPP, France). In New Zealand, the Comparative Education Research Unit within the Ministry of Education’s Research Division is responsible for PISA.

How did the OECD ensure the PISA data were of high quality?

A number of quality assurance procedures were put in place, both nationally and internationally, to ensure the data were as high a quality as possible. These included: rigorous training of staff; high-quality documentation; monitoring of sampling procedures; quality checks and monitoring at a number of stages, including during administration of the tests; multiple coding and data entry procedures; and data cleaning and checking procedures. Further details of international procedures will be found in the PISA 2009 Technical Report (forthcoming).

1 Students are aged between 15-years-3-months and 16-years-2-months. As most students are aged 15, they are referred to as ‘15-year-olds’ for brevity.

2 In New Zealand PISA was administered only in English.

3 OECD. (2009). *Assessment Framework - Key Competencies in Reading, Mathematics and Science*, p 9. Paris: OECD.

4 The countries and economies participating in PISA 2009 are listed on the back page of this report.

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Our 21st century learners at age 15

Reading literacy (main focus)

- New Zealand 15-year-old students' overall reading performance was substantially higher than the average for the 34⁵ OECD countries.
- Of the 65 countries or economies participating in PISA 2009, only two OECD countries, and two non-OECD partner economies performed better⁶ than New Zealand. Four countries were similar and the other 56 countries performed at a significantly lower level.
- Close to one in six of New Zealand students were top-performing readers.
- The proportion of New Zealand students with a low level of reading proficiency was similar to that in two high-performing⁷ countries, but the other two high-performing and the four top-performing countries showed smaller proportions.
- Girls outperformed boys in every participating country. Among the top- and high-performing countries, New Zealand had one of the largest differences between girls and boys.
- There were Asian, Māori, Pākehā/European and Pasifika students who performed at the highest level of reading literacy. While Pākehā/European and Asian students were more likely to be at the higher end, Māori and Pasifika students were over-represented at the lower end.
- New Zealand students showed particular strength in reading *non-continuous* texts (such as graphs and tables). They performed well above the average for OECD countries in reading *continuous* texts (prose).
- Overall, New Zealand had high performance in the reading competencies *accessing and retrieving* and *integrating and interpreting*. New Zealand showed a particular strength in *reflecting and evaluating* texts.
- The reading performance of New Zealand students, on average, did not change between 2000 and 2009.

Mathematical literacy (minor focus)

- New Zealand students' overall mathematical literacy performance was significantly higher than the average for the OECD countries.
- Five OECD countries and six non-OECD partner countries or economies performed better than New Zealand, four OECD countries were similar, and the other 49 countries had a significantly lower performance.
- New Zealand girls and boys achieved a similar mean mathematical literacy performance.
- New Zealand's 15-year-olds mean mathematical literacy performance did not change between 2003 and 2009.

Scientific literacy (minor focus)

- New Zealand students' overall scientific literacy performance was substantially higher than the average for the OECD countries.
- Only one OECD country and three non-OECD partner countries or economies achieved a higher mean scientific literacy score than New Zealand. Six OECD countries were similar, and the other 54 countries performed significantly lower.
- New Zealand girls and boys achieved a similar mean scientific literacy performance.
- New Zealand's 15-year-olds mean performance in scientific literacy did not change between 2006 and 2009.

⁵ Chile, Estonia, Israel and Slovenia are new OECD member countries.

⁶ Terms such as 'better', 'larger', 'weaker' or 'smaller' are used when results are statistically significant at the 0.05 level.

⁷ Top-performing countries are those with a mean score that was statistically higher than New Zealand. Countries with a mean score that is not statistically different to New Zealand are referred to as high-performing countries.



Reading Literacy (main focus)



What aspects of reading literacy does PISA measure and report on?

Reading was the main focus of PISA when the study first began in 2000. Four administrations of PISA have now been completed, and PISA 2009 marks the beginning of a new cycle with a return to a focus on reading. This allows for reading to be measured in more detail.⁸

The reading tasks in the assessment covered three dimensions or characteristics, knowledge domain (the form of reading materials): *continuous texts, non-continuous texts, mixed texts and multiple texts*; competencies or aspects (types of reading task or process): *access and retrieve, integrate and interpret, reflect and evaluate, and complex*⁹; and situations or context (the use for which the text is constructed):

personal, educational and occupational and public and scientific (see Figure 1).

These are the same as in PISA 2000, except for the integrating and interpreting scale and accessing and retrieving scale; in PISA 2000 students were only assessed on how they interpreted what they read, whereas PISA 2009 also looked at how well they *integrated it*. In PISA 2000 students were only assessed on how well they retrieved information, in PISA 2009 they were also assessed on how well they *accessed it*.

Students' reading results are reported by mean scores and proficiency levels on the two knowledge domain scales (continuous and non-continuous texts¹⁰) and on three of the four competency or aspect scales (access and retrieve, integrate and interpret, and reflect and evaluate).¹¹ Reading is also reported, as for the previous administrations of PISA, in terms of the overall *reading literacy scale*, previously referred to as the combined reading literacy scale.

⁸ The reading performance of New Zealand's 15-year-olds over the nine-year period will be measured in more detail in a national report that will be published in 2011.

⁹ Complex competency or aspect was assessed in the new PISA 2009 electronic reading assessment (ERA).

¹⁰ The other two text classifications are used to ensure an adequate coverage of the definition of reading literacy.

¹¹ In this report, reading proficiency levels are only provided on the overall reading literacy scale.



This section compares the reading results of New Zealand's 15-year-olds with the average for the 34 OECD countries, as well as the countries with a mean reading performance that was either better than, or not statistically different to, that of New Zealand's students.

An electronic reading assessment that measured how well students can read digital texts was also administered in this round of PISA. Twenty countries, including New Zealand, elected to take part in this option. The results of this assessment will be released by the OECD in 2011.

Figure 1: The PISA 2009 reading literacy framework

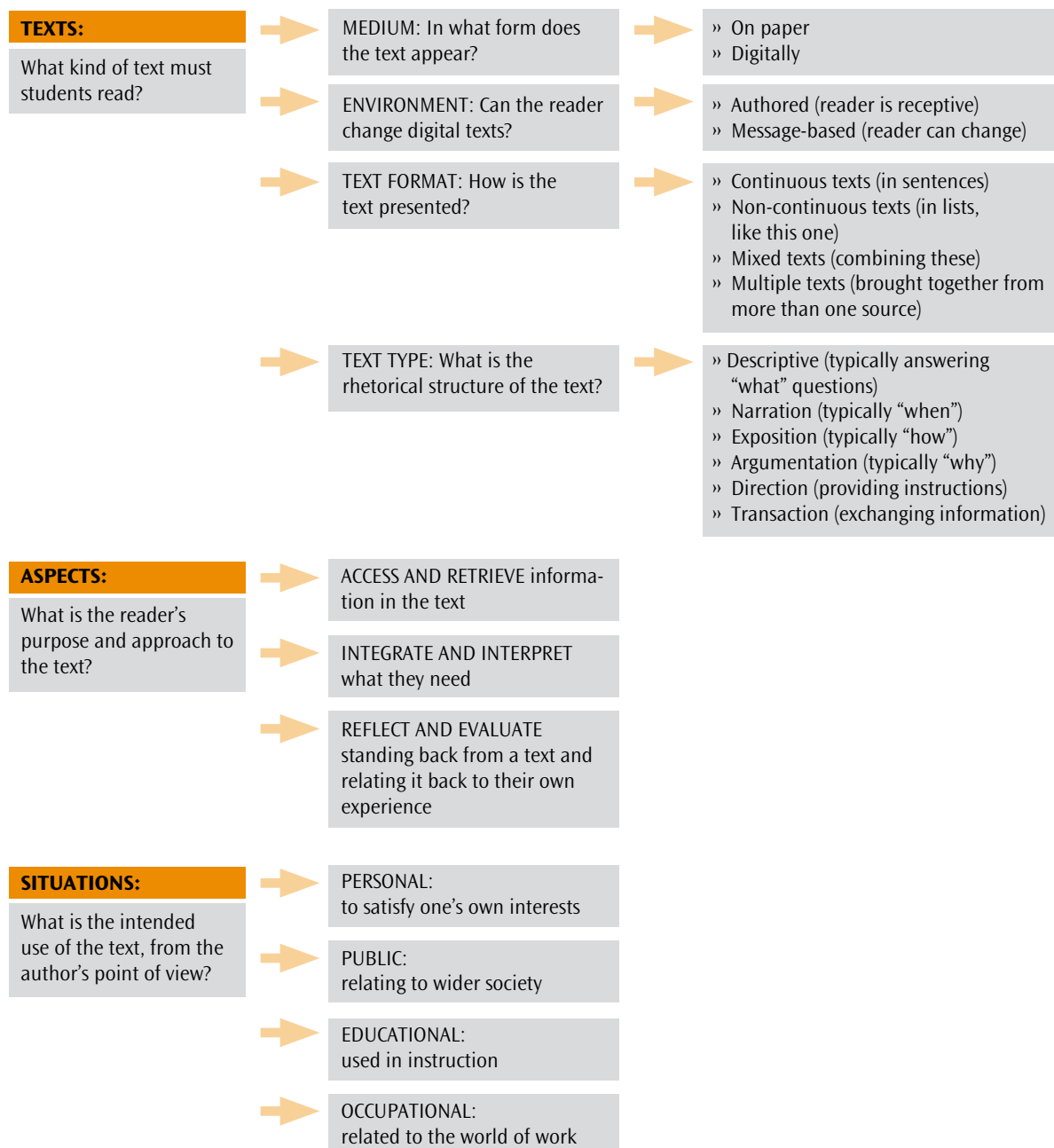


Figure 2: What the reading literacy proficiency measures

Level	Lower score limit	Percentage of students able to perform tasks at this level or above	Characteristics of tasks
6	708	0.8% of students across the OECD can perform tasks at least at Level 6 on the reading scale	Tasks at this level typically require the reader to make multiple inferences, comparisons and contrasts that are both detailed and precise. They require demonstration of a full and detailed understanding of one or more texts and may involve integrating information from more than one text. Tasks may require the reader to deal with unfamiliar ideas, in the presence of prominent competing information, and to generate abstract categories for interpretations. Reflect and evaluate tasks may require the reader to hypothesise about or critically evaluate a complex text on an unfamiliar topic, taking into account multiple criteria or perspectives, and applying sophisticated understandings from beyond the text. A salient condition for access and retrieve tasks at this level is precision of analysis and fine attention to detail that is inconspicuous in the texts.
5	626	7.6% of students across the OECD can perform tasks at least at Level 5 on the reading scale	Tasks at this level that involve retrieving information require the reader to locate and organise several pieces of deeply embedded information, inferring which information in the text is relevant. Reflective tasks require critical evaluation or hypothesis, drawing on specialised knowledge. Both interpretative and reflective tasks require a full and detailed understanding of a text whose content or form is unfamiliar. For all aspects of reading, tasks at this level typically involve dealing with concepts that are contrary to expectations.
4	553	28.3% of students across the OECD can perform tasks at least at Level 4 on the reading scale	Tasks at this level that involve retrieving information require the reader to locate and organise several pieces of embedded information. Some tasks at this level require interpreting the meaning of nuances of language in a section of text by taking into account the text as a whole. Other interpretative tasks require understanding and applying categories in an unfamiliar context. Reflective tasks at this level require readers to use formal or public knowledge to hypothesise about or critically evaluate a text. Readers must demonstrate an accurate understanding of long or complex texts whose content or form may be unfamiliar.
3	480	57.2% of students across the OECD can perform tasks at least at Level 3 on the reading scale	Tasks at this level require the reader to locate, and in some cases recognise the relationship between, several pieces of information that must meet multiple conditions. Interpretative tasks at this level require the reader to integrate several parts of a text in order to identify a main idea, understand a relationship or construe the meaning of a word or phrase. They need to take into account many features in comparing, contrasting or categorising. Often the required information is not prominent or there is much competing information; or there are other text obstacles, such as ideas that are contrary to expectation or negatively worded. Reflective tasks at this level may require connections, comparisons, and explanations, or they may require the reader to evaluate a feature of the text. Some reflective tasks require readers to demonstrate a fine understanding of the text in relation to familiar, everyday knowledge. Other tasks do not require detailed text comprehension but require the reader to draw on less common knowledge.
2	407	81.2% of students across the OECD can perform tasks at least at Level 2 on the reading scale	Some tasks at this level require the reader to locate one or more pieces of information, which may need to be inferred and may need to meet several conditions. Others require recognising the main idea in a text, understanding relationships, or construing meaning within a limited part of the text when the information is not prominent and the reader must make low level inferences. Tasks at this level may involve comparisons or contrasts based on a single feature in the text. Typical reflective tasks at this level require readers to make a comparison or several connections between the text and outside knowledge, by drawing on personal experience and attitudes.
1a	335	94.3% of students across the OECD can perform tasks at least at Level 1a on the reading scale	Tasks at this level require the reader to locate one or more independent pieces of explicitly stated information; to recognise the main theme or author's purpose in a text about a familiar topic, or to make a simple connection between information in the text and common, everyday knowledge. Typically the required information in the text is prominent and there is little, if any, competing information. The reader is explicitly directed to consider relevant factors in the task and in the text.
1b	262	98.9% of students across the OECD can perform tasks at least at Level 1b on the reading scale	Tasks at this level require the reader to locate a single piece of explicitly stated information in a prominent position in a short, syntactically simple text with a familiar context and text type, such as a narrative or a simple list. The text typically provides support to the reader, such as repetition of information, pictures or familiar symbols. There is minimal competing information. In tasks requiring interpretation the reader may need to make simple connections between adjacent pieces of information.

Source: OECD. (2010). *PISA 2009 Results: What Students Know and Can Do: Student Performance in Reading, Mathematics and Science*, Vol 1. OECD: Paris.



Of the 65 countries or economies participating in PISA 2009, only two OECD countries, and two non-OECD partner economies performed better than New Zealand. Four countries were similar, and the other 56 countries performed at a significantly lower level.

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Student performance in reading

Reading literacy scale

The reading literacy scale summarises student performance on the tasks that cover the three dimensions of the framework. This allows for an ongoing, high-level picture of reading, whether it is a minor or a major focus of a PISA administration.

The mean overall reading literacy performance of the 65 countries or economies and the percentage of students on each of the seven proficiency levels are shown in Figure 3.

Mean scores by country comparison on the reading literacy scale

New Zealand's 15-year-old students performed very strongly in reading literacy, with a mean score of 521 points. This was statistically better than the average score for the 34 OECD countries (493).

- Only two OECD countries, Korea (539) and Finland (536), achieved a better reading result than New Zealand's 15-year-olds. *Shanghai-China¹² (556) and *Hong Kong-China (533)¹³, two non-OECD partner economies, also gained significantly higher mean reading scores.
- New Zealand's mean performance was similar to that of *Singapore¹⁴ (526), Canada (524), Japan (520) and Australia (515).
- New Zealand's 15-year-olds on average outperformed their peers in 56 of the participating countries or economies, including the United States

(500), the United Kingdom (494) and 26 of the other 33 OECD member countries.

Because these results are derived from samples of students and schools, there is a margin of error associated with the mean scores reported.¹⁵ As a result, it is not possible to determine a precise ranking of a country's performance. However, it is possible to determine, with a 95 percent likelihood, the range of ranks in which a country's mean performance lies. This is expressed in terms of an upper rank and a lower rank for each country.

Among the 34 OECD countries, New Zealand's highest upper ranking in mean reading performance is third and its lowest ranking is fifth. When compared with all 65 participating countries or economies, New Zealand's upper rank is sixth and its lower rank is ninth.¹⁶

Proficiency levels (seven levels) by all students on the reading literacy scale

In this administration of PISA the reading proficiency levels have been extended from five to seven levels with the introduction of a higher level, Level 6, and a lower level, Level 1b. In PISA 2000 the most advanced reading level was Level 5 or higher (scores of 625 points or higher). At the other end of the spectrum, the lowest proficiency level was referred to as Level 1, and students at this level were those with scores lower than 334 points.

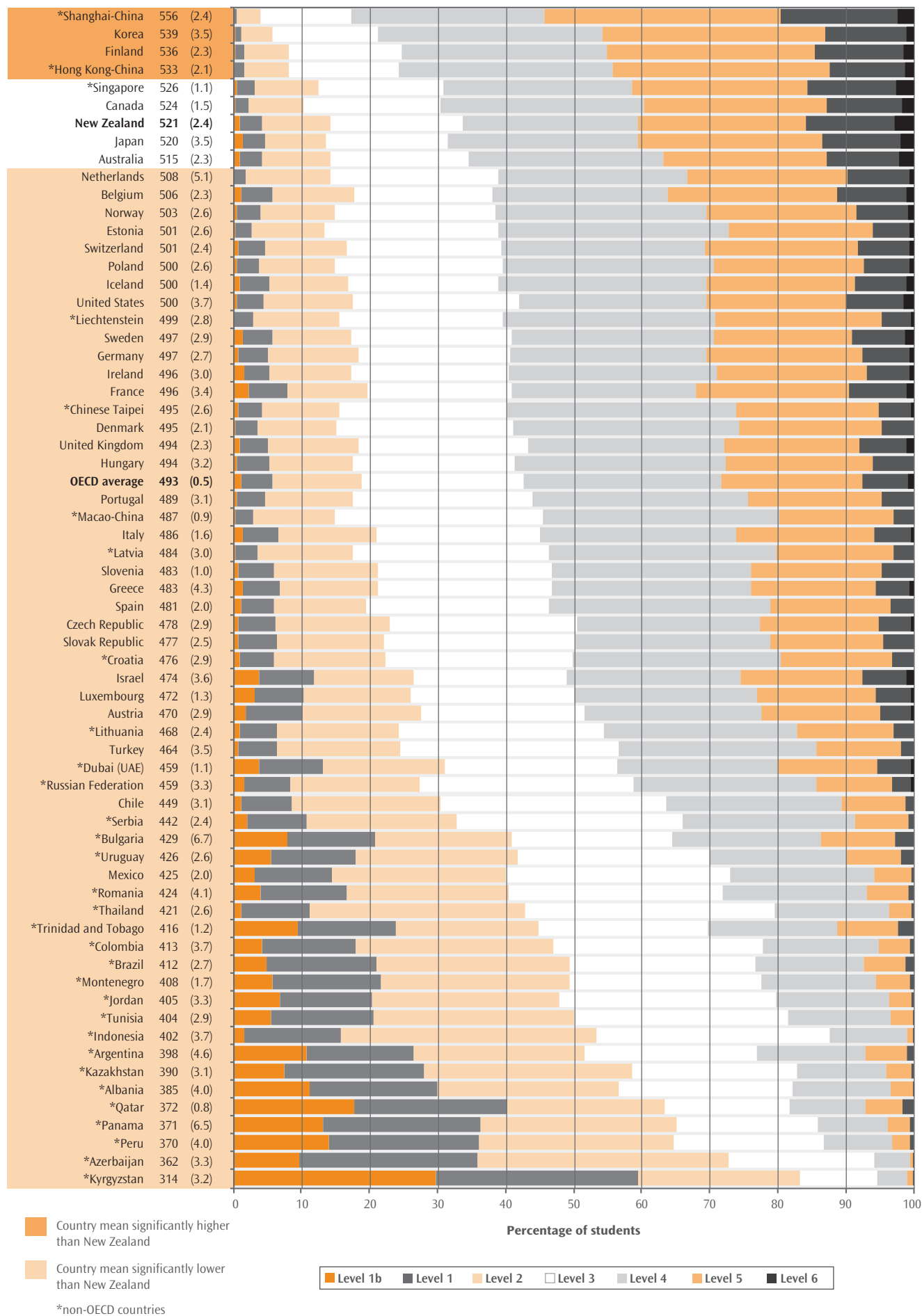
¹² Shanghai-China is a new participant in PISA.

¹³ * Denotes a non-OECD partner country or economy.

¹⁴ Singapore is also a new participant in PISA.

¹⁵ Figure 3 also provides, for each country, an estimate of the standard error of the mean. There is a 95% likelihood that a country's mean score will lie within 1.96 standard errors of the mean.

¹⁶ See the Appendix for New Zealand's range of ranking on the mathematical and scientific literacy areas, and comparisons with other top-performing countries on the three literacy areas.

Figure 3: Reading literacy proficiency levels

This new approach allows for the identification of students with either very low (Level 1b, scores from 262 to 334 points) or very high (Level 6, scores above 708 points) reading proficiency, and provides better and more detailed descriptions of their skills and knowledge.

Level 2 has been established as the baseline level at which students begin to demonstrate competencies that will enable them to participate actively in life situations that are related to the three key subject areas assessed.

For a full description of the types of tasks that students can typically perform at each reading proficiency level, see Figure 2. It should be noted that students achieving a particular proficiency level are also considered to be proficient at the lower levels. For example, students proficient at Level 5 are considered to be proficient in reading at the four lower levels.

Level 6 (scores above 708 points) and Level 5 (scores 626 to 708 points)

Proficiency Level 6 tasks required students to demonstrate very advanced reading skills. For example, students at this level showed they were able to make multiple inferences, comparisons and contrasts from texts that were both detailed and precise.

Students achieving Level 5 are also described as top performers, as they were required to demonstrate they were capable of dealing with concepts that are not straightforward.

- Three percent of New Zealand's and *Singapore's 15-year-olds showed advanced reading skills; that is, they achieved Level 6. This proportion was similar to that found in *Shanghai-China, Australia and Japan – all with two percent.
- New Zealand (16%) and Finland (15%), along with the two new PISA participants *Shanghai-China (19%) and *Singapore (16%), had at least 15 percent of their students showing proficiency in reading at Level 5 or higher (a combination of Levels 5 and 6). In Japan (13%), Korea (13%), Australia (13%), Canada (13%) and *Hong Kong-China (12%), more than 10 percent of students were at these levels.
- In the other two large English-speaking countries, the United States (10%) and the United Kingdom (8%), the proportion reaching Level 5 or higher was smaller. This was also the case for the average across the 34 OECD member countries (8%).

Close to one in six of New Zealand students were top-performing readers.

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Level 4 or higher (scores above 552 points)

Readers at this level were required to demonstrate an accurate understanding of long or complex texts whose content or form may be unfamiliar.

- More than half of *Shanghai-China's 15-year-olds (54%) were proficient at Level 4 or higher, and at least 40 percent of students from Korea (46%), Finland (45%), *Hong Kong-China (44%), *Singapore (41%), New Zealand (41%), Japan (40%) and Canada (40%) demonstrated proficiency at these levels. Statistically smaller proportions of students from Australia (37%), the United States (30%) and the United Kingdom (28%) were proficient at one of these three upper levels relative to New Zealand. The average for the OECD was 28 percent.

Level 1a (scores from 335 to 407 points) and Level 1b (scores from 262 to 334 points) or below (scores below 262 points)

Students with Level 1a proficiency were able to locate one or more pieces of information explicitly stated and identify the main theme of a text. The reader was explicitly directed to consider relevant factors in the task and in the text. At the new lower level, Level 1b, there was minimal competing information requiring interpretation. The reader may have needed to make simple connections between adjacent pieces of information as the text typically provided support to the reader.

- Fourteen percent of New Zealand students did not achieve Level 2 reading literacy. This is the same proportion as Australia (14%) and Japan (14%). When compared to New Zealand, smaller proportions were at these levels in the six other top- or high-performing countries or economies: *Shanghai-China (4%), Korea (6%), Finland (8%),



The proportion of New Zealand students with a low level of reading proficiency was similar to that in two high-performing countries, but the other two high-performing and the four top-performing countries showed smaller proportions.

*Hong Kong-China (8%), Canada (10%) and *Singapore (12%).

- The proportion of students not reaching Level 2 in the two other large English-speaking countries – the United Kingdom (18%) and the United States (18%) – was larger than in New Zealand, Australia or Canada.
- At the lowest end of the proficiency scale, PISA 2009 Level 1b or below, Japan (5%), New Zealand (4%) Australia (4%) and *Singapore (3%) all showed slightly larger proportions than the five other top- or high-performing countries or economies. In the four top-performing countries or economies, two percent or less were at these levels. The proportion of students for the United States (5%) and the United Kingdom (5%) at the PISA 2009 lowest level was similar to that in New Zealand.
- Across the 34 OECD countries, an average of 19 percent of students were not proficient in reading at Level 2, and six percent of these students did not reach Level 1a.

Overall 15-year-olds from *Shanghai-China, a new non-OECD PISA participant, clearly outperformed their peers in each of the 64 other participating countries or economies with a score that was 17 points higher than any other participating country or economy.

At the top reading proficiency levels, 16 percent of New Zealand's students achieved a score of at least 626 points. Among these students three percent achieved the new advanced PISA 2009 reading proficiency level, with a reading score of more than 708 points. While the percentage of New Zealand student at Level 5 or higher was three percentage points lower than in 2000 (19%), only *Shanghai-China (19%) exceeded the proportion of New Zealand's students at the top level of proficiency in 2009.

The proportion of New Zealand's weaker readers was larger than in the majority of the top- or high-performing countries, but similar to that in Australia and Japan.

Mean scores by gender on the reading literacy scale

In each of the 65 participating countries or economies, girls showed a significantly stronger reading performance than boys.

- New Zealand's 15-year-old girls achieved an average of 544 score points, 46 points greater than their male counterparts (499).¹⁷
- The New Zealand girls' average reading performance was stronger than that of their Australian counterparts (533), but similar to that in *Hong Kong-China (550), *Singapore (542), Canada (542) and Japan (540). However, girls in *Shanghai-China (576), Korea (558) and Finland (563) achieved a significantly stronger result.
- The average performance of boys in Japan (501) and Australia (496) was similar to that of New Zealand's boys. Boys in the remaining top- or high-performing countries or economies – *Shanghai-China (536), Korea (523), *Hong Kong-China (518), *Singapore (511), Finland (508) and Canada (507) – showed a significantly stronger result.

More than 20 points separated boys' and girls' mean reading performance in every participating country or economy, except for *Colombia (a difference of 9 points). This disparity is reflected in the OECD average gender difference of 39 points (girls 513, boys 474). When comparing the nine top- or high-performing countries, Finland (55 score point difference) and New Zealand (46) showed the largest difference in favour of girls.

Proficiency levels by gender on the reading literacy scale

Level 6 (scores above 708 points) **and Level 5** (scores 626 to 708 points)

- Not surprisingly, a larger proportion of New Zealand's girls (4%) than boys (2%) achieved the highest level of reading proficiency, Level 6. It should be noted that no other participating country achieved a larger proportion of either boys or girls at this level.
- *Hong Kong-China (boys 1%, girls 2%) and Korea (boys 1%, girls 1%) had proportionally fewer

¹⁷ Because the results are rounded to the nearest whole number, this difference appears inconsistent.



boys and girls than New Zealand at Level 6 and Finland (1%) slightly fewer boys. The remaining five top- or high-performing countries achieved similar proportions of both boys and girls to New Zealand.

- At least one in five 15-year-old girls in New Zealand (20%), *Shanghai-China (26%) and Finland (21%) were top-performing readers; that is, they were proficient in reading at one of the two highest levels, a proportion that was twice the OECD average.¹⁸
- In contrast, the proportion of boys succeeding at Level 5 or higher was substantially smaller; *Shanghai-China (13%), New Zealand (12%), *Singapore (12%) and Japan (10%) were the only participating countries or economies that had more than 10 percent of boys at these levels. Nevertheless, as found for girls, the proportion of New Zealand boys at these levels was over twice the OECD average (5%).

Level 4 or higher (scores above 552 points)

- Around half (49%) of New Zealand's girls were at Level 4 or higher, while a third (32%) of their male counterparts were at these levels.
- Japan (34%), Canada (33%), Finland (32%) and Australia (30%) also had around a third of their 15-year-old boys achieve Level 4 or higher, but the average proportion of boys across OECD countries was substantially smaller (22%). In the remaining four top- or high-performing countries or economies, more than 35 percent of boys were proficient at these levels: *Shanghai-China (44%), Korea (38%), *Hong Kong-China (37%) and *Singapore (36%). In the United States (27%) and the United Kingdom (24%), the average was around a quarter.
- Well over half of the girls in *Shanghai-China (64%), Finland (58%), Korea (55%) and *Hong Kong-China (53%) were at Level 4 or higher. Japan (47%), *Singapore (47%), Canada (46%) and Australia (43%) also had substantially more girls at these levels than the OECD average (35%), the United States (34%) and the United Kingdom (31%).

Girls outperformed boys in every participating country. Among the top- and high-performing countries, New Zealand had one of the largest differences between girls and boys.

Level 1a (scores from 335 to 407 points) **and Level 1b** (scores from 262 to 334 points) **or below** (scores below 262 points)

- Although fewer than 10 percent of New Zealand's girls (8%) did not reach Level 2, one in every five boys was at these lower levels (21%). A similar pattern to New Zealand was observed in Australia (boys 20%, girls 9%) and Japan (boys 19%, girls 8%).
- *Singapore (9%) had a similar proportion of girls to New Zealand, while the other top- or high-performing countries all achieved smaller proportions of boys (including *Singapore for boys) and girls at these levels (ie, not scoring above 407 points).
- Seven percent of New Zealand's boys scored below 334 score points (the former PISA 2000 - 2006 'below Level 1' reading proficiency), while only one percent of their female counterparts were at this level. This was also the case in Japan (boys 7%, girls 2%), Australia (boys 6%, girls 2%), *Singapore (boys 5%, girls 1%) and the average for all OECD countries (boys 8%, girls 3%). Statistically smaller proportions of boys were observed at Level 1b or below in the other top- or high-performing countries or economies.

In short, in all the participating countries or economies, girls achieved significantly better than boys, whether we look at mean scores or proficiency levels. The difference in the mean reading performance for girls and boys in New Zealand was the second largest among the top- or high-performing countries or economies. It was exceeded only by Finland, which had proportionally fewer boys with high levels of proficiency.

¹⁸ As noted earlier, Level 5 or higher was the highest reading proficiency level in earlier PISA administrations. The term 'top reading performers' has been retained by the OECD to refer to students who are proficient in reading at Level 5 or higher.



There were Asian, Māori, Pākehā/ European and Pasifika students who performed at the highest level of reading literacy. While Pākehā/ European and Asian students were more likely to be at the higher end, Māori and Pasifika students were over represented at the lower end.

Mean scores by ethnic group/s on the reading literacy scale

Students taking part in PISA were asked to provide information about their ethnic group/s. Students were asked to identify the ethnic groups they belonged to. Those who identified that they belonged to more than one group were counted in each of those groups.¹⁹

- Students identifying as Pākehā/European, who comprised 71 percent of all students, achieved an average reading score of 541 score points in reading literacy. Students identifying as Asian (14%) scored 522 points, which was still significantly above the OECD mean (493).
- Those students identifying as Māori (19%) and Pasifika (10%) scored 478 score points and 448 score points, respectively. This was below the OECD mean.

Proficiency levels by ethnic group/s on the reading literacy scale

Level 6 (scores above 708 points) **and Level 5** (scores 626 to 708 points)

- One in five (19%) of the students identifying as Pākehā/European demonstrated a reading ability that was at Level 5 or higher. Four percent of these students had exceptional skills, achieving Level 6. The proportion of Asian students at Level 5 or higher was 16 percent. Smaller proportions of students who identified as Māori (7%) and Pasifika (4%) achieved a score that was greater than 626 (Level 5 or higher).²⁰

¹⁹ The reporting of total ethnicity data is consistent with the Statistics New Zealand standard, but differs from the prioritised classification method used in previous PISA reporting (2000, 2003 and 2006) and many other Research Division reports. As part of this transition, mean scores by ethnic grouping have also been analysed using the prioritisation classification method: Māori (478), Pasifika (446), Asian (526), and Pākehā-European (546).

²⁰ The proportions of Asian, Māori and Pasifika students achieving at Level 6 were less than 3%. With fewer than 30 students in each grouping at this level in the PISA sample, there were too few students for reliable comparisons to be made.

Level 4 or higher (scores above 552 points)

- Almost half of students identifying as Pākehā/ European (48%) were proficient readers at Level 4, and a slightly smaller proportion of Asian (41%) students scored at this level. A quarter of Māori (23%) students achieved a score that was greater than 552 (ie, Level 4 or higher). Proportionally fewer (17%) Pasifika students scored at this level.

Level 1a (scores from 335 to 407 points) **and Level 1b** (scores from 262 to 334 points) **or below** (scores below 262 points)

- Around a third of Pasifika (35%) and a quarter of Māori (24%) students did not show reading proficiency above Level 1a. A substantially smaller proportion of Asian (15%) and Pākehā/European (9%) students scored at this level.
- A similar pattern was seen for the proportions of students at Level 1b and below, where there were proportionally fewer Pākehā/European (2%) and Asian (3%) than Māori (6%) and Pasifika (13%) students.

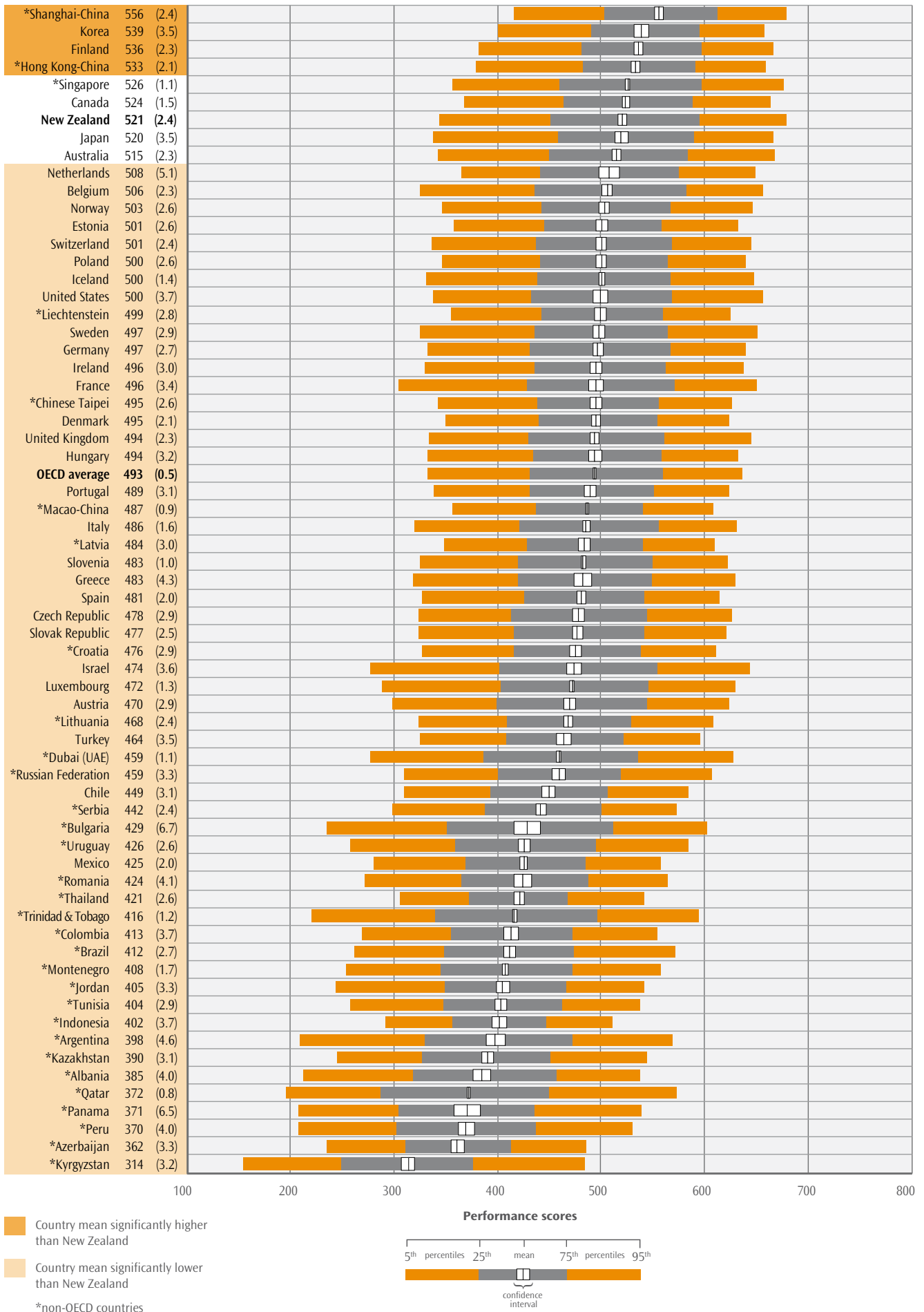
The performance of students in each ethnic group was diverse. In each group there were students whose performance was poor and students who had advanced knowledge and skills.

However, the reading mean score for Māori and Pasifika students was lower than for Pākehā/European and Asian students. A small proportion of Māori and Pasifika students achieved at the highest levels of proficiency, but they were over-represented at the lower levels relative to the students from the other two ethnic groups.

In numerical terms, Pākehā/European was the largest ethnic group at the low proficiency levels as well as the high proficiency levels. This was also the case for mathematics and science.

Distribution of students on the reading literacy scale

Examining the distribution of student reading scores provides a high-level picture of the extent of the diversity in students' reading ability within a country (see Figure 4). Countries with a wide spread of student achievement will have a larger disparity between high and low achievers within their country.

Figure 4: Reading literacy distribution

Highest- and lowest-performing students:
95th and 5th percentile

- Among the eight top- or high-performing countries or economies, New Zealand had the widest range of scores (335) between the bottom five percent (5th percentile) and top five percent (95th percentile) of students, followed by Japan (328) and Australia (325). This is mostly accounted for by the fact that the top five percent of New Zealand's students (678) outperformed their counterparts in Australia (668) and Japan (667)²¹, while the 5th percentile in Australia (343) and Japan (339) was about the same as in New Zealand (344).
- New Zealand (678), *Shanghai-China (679) and *Singapore (676) were the only countries or economies where five percent or more of students achieved more than 670 score points. However, the performance of New Zealand's lowest five percent with scores of 344 or less, was lower than all but three, (Japan, Australia – as noted above – and *Singapore) of the top- or high-performing countries or economies.

Middle-range performing students:
25th–75th percentile

- The range of scores (143 points) between New Zealand's bottom quarter (25th percentile) and top

quarter (75th percentile) of students was also greater than in any other top- or high-performing country or economy. In contrast, the range for the four top-performing countries was less than 120 score points (Korea 105, *Hong Kong-China 110, *Shanghai-China 109 and Finland 116). The other four top- or high-performing countries ranged between 124 (Canada) and 137 (*Singapore) score points.

- New Zealand was one of six OECD countries that exhibited more than 140 score points between the top and bottom quarter students. The others were Israel (153), Belgium (147), Austria (146), France (143) and Luxembourg (143).
- As found for New Zealand's bottom five percent of students, the 25th percentile score of 452 was about the same as in Japan (459) and Australia (450), but lower than the other top- or high-performing countries or economies.
- In contrast, New Zealand's top quarter of students achieved scores of 595 or higher. This was higher than in Australia (584) and Canada (588) and, with the exception of *Shanghai-China (613), much the same as the rest of the top- or high-performing countries or economies.

Although New Zealand continues to show a wide range of scores in reading, not all this difference can be attributed to low performing students. The success of the highest performing students also increased the size of the spread.

²¹ A large standard error for Japan's 5th percentile score means that the difference between Japan and New Zealand is not statistically significant.

Knowledge domains: text formats

Continuous and non-continuous texts

Student performance on the *continuous* and *non-continuous* texts format scales is reported here because they describe the two ways in which texts are commonly structured in everyday life: either in sentences and paragraphs (*continuous*), or in other formats such as lists, diagrams, graphs and tables (*non-continuous*). Just under two-thirds of the questions related to continuous texts and around a third to non-continuous texts. *Mixed* (a mixture of both continuous and non-continuous) and *multiple* (from more than one source) text formats are also incorporated into the reading assessment so that PISA's definition of reading literacy is adequately covered.

Mean scores by all students on continuous and non-continuous texts

- New Zealand (532) performed strongly on the tasks that measured students' ability to read *non-continuous* texts relative to those that measured students' ability to read *continuous* texts (518). Australia, the United Kingdom and *Singapore, as well as *Liechtenstein and Estonia, were the only other PISA participating countries or economies to show a score of more than 10 points higher on the *non-continuous* texts than the *continuous* texts.
- Students from three of the East-Asian countries or economies – Korea (542), *Shanghai-China (539) and *Singapore (539) – were the only



participants to achieve a better result than New Zealand's students on the *non-continuous* texts scale. Finland's (535) and Canada's (527) mean performance was about the same as New Zealand's, while that of the three other top- or high-performing countries was lower: Australia (524), *Hong Kong-China (522) and Japan (518). This was also the case for the United Kingdom (506), the United States (503) and the OECD average (493).

- The mean performance of students on the *continuous* texts scale from three of the top- or high-performing OECD countries – Korea (538), Finland (535) and Canada (524) – and two of the partner economies – *Shanghai-China (564) and *Hong Kong-China (538) – was better than New Zealand's. Although New Zealand's 15-year-olds performed about the same as their peers from *Singapore (522) and Japan (520), they performed better on this scale than their peers from Australia (513), the United States (500), the United Kingdom (492) and the average across the 34 OECD countries (494).

Mean scores by gender on non-continuous texts

- In all OECD countries (including New Zealand), girls outperformed boys on the two text formats. In New Zealand a gender difference of well over half a proficiency level (44) was found. Finland (54) was the only other top- or high-performing country with a gender difference of more than 40 points.
- On the non-continuous texts scale, New Zealand's girls' achievement (555) put it among the countries or economies where girls achieved 550 score points or more – Finland (562), Korea (559), *Shanghai-China (557) and *Singapore (553). The mean performance of girls from the remaining four top- or high-performing countries was lower than that of New Zealand's girls: Canada (544), Australia (541), Japan (537) and *Hong Kong-China (536). This was also true for girls from the United Kingdom (518), the United States (514) and the average for OECD countries (511).
- Although New Zealand boys' mean performance (511) on reading non-continuous texts was substantially weaker than that for girls, they achieved a similar result to boys from Canada (511), *Hong Kong-China (510), Finland (508), Australia (507) and Japan (499). Boys from Korea (527), *Singapore (524) and *Shanghai-China (522) all achieved a better result. As found for girls, New

New Zealand students showed particular strength in reading non-continuous texts (such as graphs and tables). They also performed well above the average for OECD countries in reading continuous texts (prose).

Zealand's boys outperformed boys from the United Kingdom (492) and the United States (492), and scored above the average for OECD countries (475).

Mean scores by gender on continuous texts

- A similar gender pattern was found on the continuous texts scale as was found for non-continuous texts. Well over half a proficiency scale separated New Zealand's boys' (495) and girls' (542) mean performances. Finland (56) and *Shanghai-China (45) were the only other top- or high-performing countries or economies to show a gender difference of more than 40 score points on this scale. However, across all the OECD countries, 42 score points separated boys and girls.
- Boys in Japan (501) and Australia (493) achieved a result that was about the same as New Zealand's boys, while boys in the remaining six top- or high-performing countries or economies all gained a significantly better result: *Shanghai-China (541), Korea (520), *Hong Kong-China (520), Finland (507), Canada (506) and *Singapore (506).
- Only girls from the four top-performing countries or economies – *Shanghai-China (587), Finland (563), *Hong Kong-China (559) and Korea (558) – were better than New Zealand's girls at reading continuous texts. In three of the four large English-speaking countries – Australia (532), the United States (513) and the United Kingdom (504) – girls' mean performance was significantly lower than in New Zealand. In Canada (543), Japan (541) and *Singapore (538) it was about the same.



Overall, New Zealand had high performance in the reading competencies *accessing* and *retrieving* and *integrating* and *interpreting*, and showed a particular strength in *reflecting* and *evaluating* texts.

Reading literacy aspects/competencies

Access and retrieve, integrate and interpret, reflect and evaluate

The three reading literacy aspects are reported because they are processes that are integral to proficient reading. They identify how readers engage with a text.

Mean scores by all students on the three reading literacy aspects

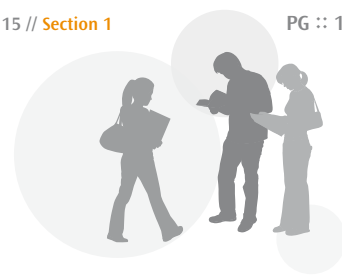
- New Zealand students performed very strongly on the *reflect and evaluate* scale (531). The only 15-year-olds to outperform New Zealand students on this scale were those from three East-Asian participating countries or economies: *Shanghai-China* (557), Korea (542) and *Hong Kong-China (540). Finland (536), Canada (535) and *Singapore (529) achieved an average scale score that was similar to New Zealand's.
- New Zealand's 15-year-olds also performed strongly on the *access and retrieve* (521) and the *integrate and interpret* (517) scales.
- Students from the four top-performing countries or economies, along with *Singapore, achieved higher scores than New Zealand students on both the *access and retrieve* and the *integrate and interpret* scales.
- Canada showed a similar performance to New Zealand on the *integrate and interpret* and the *access and retrieve* scales, while Australian students' mean performance (513) was significantly below New Zealand's on the latter.
- The average performance on the three literacy aspects for 15-year-olds from the United Kingdom and the United States was significantly lower than

in New Zealand. This was also true for the average across OECD countries: *integrate and interpret* 493, *reflect and evaluate* 494 and *access and retrieve* 495.

Mean scores by gender on the three reading literacy aspects

- Although New Zealand boys' average score on the three reading literacy aspects was significantly lower than that of their female counterparts, this was also the case for all participating countries and economies.
- New Zealand girls, on average, performed very strongly on the *reflect and evaluate* scale (556), a score that was 51 points greater than the boys' (506).²² Finland (59) and *Shanghai-China (50) were the only other top- or high-performing countries or economies with a gender difference of 50 points or more. The average OECD gender difference was 44 score points, with boys averaging 472 and girls 517.
- Girls in New Zealand also performed strongly on the *access and retrieve* scale (546), a score that was significantly higher than the mean performance of boys (497). Finland (59) and New Zealand (49) were the only top- or high-performing countries or economies to show a gender difference of more than 40 points on this scale. The average gender difference across all OECD countries was 40 score points, with boys averaging 475 and girls 515.

²² Because the results are rounded to the nearest whole number, this difference appears inconsistent.



- Again, on the *integrate and interpret* scale more than 40 score points separated New Zealand's boys (497) and girls (539). This was also the case in Finland (with a 50 score points gender difference). The OECD average gender difference was 36 score points, with boys averaging 476 and girls 512.

Although girls in each of the participating countries or economies outperformed boys, New Zealand, along with Finland, showed particularly large gender differences on each of the three reading aspects and the two text formats.

The reading performance of New Zealand students, on average, did not change between 2000 and 2009.

Changes in reading literacy performance Between 2000 and 2009

As noted earlier, 2009 was the first time reading was reassessed as a main focus of PISA. Because there have been no major changes in the reading literacy framework since PISA 2000, it is possible to measure reading trends from 2000 to 2009, such as whether reading outcomes or gaps between higher- and lower-performing students have changed over the nine-year period. Forty-two of the PISA 2009 participating countries or economies also took part in the first administration of PISA.²³ However, four of these countries – Austria, Luxembourg, the Netherlands and the United Kingdom are not reported.²⁴ Twenty-six of the 38 countries or economies reported here are OECD members. Consistent with other results in this report, this section reports the changes in reading performance at the high level.

Mean scores by country comparisons between 2000 and 2009

- Just over half of the 26 OECD countries, including New Zealand, showed no change in mean reading performance. Seven showed an improvement and four a decrease.

- Six of the seven OECD countries that showed an improved reading mean reading performance since PISA 2000 were those with a performance that was below the OECD mean in 2000. Among these countries, 15-year-olds in Poland (+21), Hungary (+14) and Germany (+13) increased their mean reading performance to the OECD mean, with Poland showing the most marked improvement.
- Among the countries with a PISA 2000 reading mean that was above the OECD mean, Korea (+15) was the only country to achieve an improved mean reading performance.
- The reading performance of 15-year-olds in *Peru and Chile was well below the OECD mean in both PISA 2000 and in PISA 2009, but they showed the most marked improvement of the 38 countries or economies in PISA 2009 (+43 and +40, respectively).
- Ireland, Sweden and Australia were the only countries with a performance that was higher than the OECD mean in 2000 to show a decline in performance over the nine years. The largest decrease was found in Ireland (-31), followed by Sweden (-19) and Australia (-13). Ireland and Sweden's overall performance decreased to the OECD mean in 2009, whereas Australia's reading mean result remained above the OECD mean.

²³ PISA 2000 here includes the countries that participated in PISA 2000 and PISA 2000 plus (PISA 2000 plus was administered in 2001).

²⁴ The Netherlands, United Kingdom (response rate issues) and Luxembourg (linguistic issues) did not meet the PISA established technical standards for the quality of data sets, and their results have been treated as missing. For further detail, see PISA 2009 Technical Report (forthcoming).

The comparability of Austria's 2009 data with the data from previous cycles cannot be ensured. This is because of education disputes in Austria at the time of the PISA 2009 assessment.

Proficiency levels by country comparisons between 2000 and 2009

Level 5 or higher (scores above 625 points)

- Over the nine-year period only four of the twenty-six OECD countries and two partner countries achieved a larger proportion of students achieving Level 5 or higher.
- Two of the four top-performing countries or economies, Korea and *Hong Kong-China, had an increase in the proportion of students who achieved the highest levels. Korea had the largest increase (+7%), followed by Japan (+4%), *Hong Kong-China (+3%), Israel (+3%), Chile (+1%) and Brazil (+1%).
- In contrast, nine OECD²⁵ countries and one partner country had a statistically significant decrease between the two PISA administrations (2000–2009), including New Zealand (-3%). Ireland showed the largest decrease (-7%).
- Three other top- or high-performing countries, two of which are also English-speaking countries, showed a decrease of three percent or more: Australia (-5%), Canada (-4%) and Finland (-4%).
- Three other Scandinavian countries – Denmark (-3%), Norway (-3%) and Sweden (-2%) – also had a smaller proportion of students achieving Level 5 or higher in PISA 2009 than in PISA 2000, along with the Czech Republic (-2%) and the partner country Romania (-1%).

Level 1a or below (scores below 407 points)

- Between the two PISA administrations there was no change in the proportion of students not reaching Level 2 in any of the top- or high-performing countries or economies. Japan did show an increase of four percent, but this was not statistically significant.
- Seven OECD countries – Austria (+8%), Ireland (+6%), Czech Republic (+6%), Sweden (+5%), France (+5%), Spain (+3%) and Iceland (+2%) – and the partner country *Thailand (+6%) all showed proportionally more students at or below Level 1a (ie, not achieving Level 2 reading proficiency) in 2009 compared to 2000.

- Eight OECD countries and five partner countries all showed a reduction in the proportion of students not reaching Level 2; Chile (-18%) showed the largest decrease.
- Switzerland (-4%) and Denmark (-3%) were the only countries with a mean reading performance in PISA 2000 that was at the OECD mean to show a reduction in the proportion of students at the lowest levels. Poland (-8%) and *Liechtenstein (-6%) were the only countries with a mean reading performance that was similar to the OECD mean in PISA 2009, but lower than the OECD mean in 2000, to show a decrease in the proportion of students at the lower levels.
- Four OECD countries²⁶ and four partner countries with a mean reading performance lower than the PISA 2000 OECD mean also showed a reduction in the proportion of students at these lower levels.

Mean scores by gender between 2000 and 2009

- There was no change in the performance of New Zealand's 15-year-old girls or boys in reading literacy between 2000 and 2009. There was also no change in the difference between the means for boys and girls over the nine years.
- No country showed a reduction in the reading gender gap, but some showed an increase. The largest increases in the gender gap were found in Korea (+21), Israel (+27) and *Romania (+29), where the difference doubled in all three. In each of these countries the increased gender gap was a result of girls' improved reading performance; boys' reading performance remained about the same.

In summary, New Zealand's mean reading performance did not change over the nine year period, 2000 to 2009. Korea was the only top- or high-performing country or economy where mean reading performance increased. Six countries' reading performance declined, including Australia's. While New Zealand, along with Canada, Finland and Australia had proportionally fewer students at the top proficiency levels than in 2000, *Shanghai-China was the only country with proportionally more students than New Zealand at the top levels in this round of PISA.

²⁵ The United States also showed a 2% decrease, but the difference between 2000 and 2009 was not statistically significant due to a larger standard error (1.6).

²⁶ The new OECD member country, Israel, showed a decrease of 7%, but this decrease was not statistically significant due to the relatively large standard error (3.4).



New Zealand's 15-year-olds results showed a strong relationship with enjoyment of reading and reading ability.

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Students' engagement in reading

Reading achievement

Students taking part in the PISA assessment also completed a questionnaire, which included questions that focused on students' reading habits (reading enjoyment, time spent on reading for enjoyment, reading for school, diversity of reading materials, and online reading activities) and reading strategies. This section provides information on students' reading enjoyment. Further reporting that covers the other aspects noted above will be available next year.

Reading enjoyment

PISA's index of 'reading enjoyment' was derived from students' level of agreement with a series of questions on students' reading activities.

- New Zealand 15-year-olds' average reading enjoyment (0.13) was greater than the OECD average (0.00).²⁷ Of the nine high-performing countries, Finnish (0.05) and Australian (0.00) students showed the lowest reading enjoyment.
- When comparing New Zealand 15-year-olds' reading enjoyment with the enjoyment of their peers from the three other large English-speaking countries, New Zealand students were about as positive as Canadian students (0.13), but more positive than those in the United Kingdom (-0.12) and the United States (-0.04). Only students

from four East-Asian countries or economies – *Shanghai-China (0.57), *Hong Kong-China (0.32), *Singapore (0.29) and Japan (0.20) – indicated a higher level of reading enjoyment, while Koreans (0.13) showed the same enjoyment level as New Zealand.

- Not surprisingly, enjoying reading was strongly related to students' reading ability. This was particularly marked in New Zealand and Australia, with the top quarter of New Zealand students high on this index achieving a mean reading performance of 593 score points, while the quarter of students who enjoyed reading the least gained an average score that was 127 score points lower (466).²⁸ Finland (121) was the only other top- or high-performing country or economy with more than 120 score points difference between these two groupings.
- Although New Zealand's girls (0.44) were much more likely than their male counterparts (-0.17) to enjoy reading, the gender differences in Finland (boys -0.41, girls 0.50) and Canada (boys -0.28, girls 0.55) were larger. In Australia, the United States and *Singapore the differences were about the same as in New Zealand. Korea showed the smallest gender gap on this index, followed by three other East-Asian countries or economies (*Hong Kong-China, *Shanghai-China and Japan), and then the United Kingdom.

²⁷ The OECD mean index was set at zero. If a country has a negative index value this is because the students responded less positively to the underlying questions than students, on average, across the OECD. Therefore a negative mean index does not necessarily imply that students responded negatively to the underlying questions. OECD (2010). *Learning to Learn: Student Engagement, Strategies and Practices*. Vol. 3. Paris: OECD.

²⁸ For Australia there was a difference of 134 score points from the bottom quarter (454) to the top quarter (588).

Reading activities from which the reading enjoyment index was derived

- Except for Australia (42%), New Zealand students (40%) were as likely as, or slightly more likely than, students from the other top-performing countries to agree that they *only read books to get the information they need*; close to half of students from the United Kingdom (48%) and the United States (47%) agreed with this statement.
- Just under a third of New Zealand students (31%) reported that they *found it hard to finish [reading] books*, a proportion that was broadly similar to Australia (33%), Korea (32%), the United States (31%) and the OECD average (33%), but smaller than the United Kingdom (37%) and *Singapore (35%). In *Shanghai-China, *Hong Kong-China, Japan, Canada and Finland, around a quarter of students found it hard to finish books.
- *Shanghai-China (11%), Finland (35%) and *Singapore (35%) were the only other high-performing countries or economies with students who were less likely than New Zealand's students (38%) to report that they *read only when they have to*. More than half of the Korean students (55%) agreed with this statement.
- Proportionally fewer New Zealand (18%) students than their peers in the four large English-speaking countries – Canada (22%), the United Kingdom (23%), Australia (26%) and the United States (26%) – thought that *reading was a waste of time*. Students from *Shanghai-China students were the least likely to agree with this statement (6%).
- Although close to one in five New Zealand students reported that they *cannot sit still and read for more than a few minutes* (18%), only four of the high-performing countries or economies had a smaller proportion. In Canada, Australia, the United States, the United Kingdom and the average for OECD countries, around a quarter of students indicated that they cannot sit still and read for more than a few minutes.
- Students from two Chinese economies, *Shanghai-China (70%) and *Hong Kong-China (65%), were more likely to report that *reading was one of their favourite hobbies* than their peers from the six other top-performing countries, including New Zealand (38%). Nevertheless, among the other high-performing countries or economies, only students from *Singapore (54%) and Japan (42%), on average, were more likely than New Zealand students to report reading as a favourite hobby.
- Approximately half of New Zealand's students *liked expressing their opinions about books they had read* (49%) and *going to the bookstore or library* (54%), and around forty percent of them reported that they *liked talking about books to other people* (43%) and *exchanging books with their friends* (38%). Students from three non-OECD partner countries or economies – *Shanghai-China, *Hong Kong-China and *Singapore – were all more likely to agree with these statements than New Zealand students.
- Well over half of New Zealand students reported that they *liked receiving a book as a present* (57%). *Shanghai-China (69%) was the only PISA participating country or economy where students were more likely to report that they liked receiving a book as a present.
- In relation to the four large English-speaking countries and the OECD average, New Zealand students were as likely or more likely to regard *reading as a favourite hobby*, and to *like talking about books to other people* and *going to a book store or library*. On average, proportionally fewer students from the four large English-speaking countries than in New Zealand (a third or less) *liked exchanging books with friends*.
- Across the OECD countries, on average, and in Canada, significantly more students *liked expressing their opinions about books that they had read* than New Zealand students. In the United States the proportion was similar to New Zealand, but in Australia and the United Kingdom proportionally fewer students reported that they liked expressing their opinions about books they had read.

The value and importance of reading and the complexities in mastering the skill are eloquently captured by the OECD: “[s]uccess in reading provides the foundation for achievement in other subject areas and for full participation in adult life. The ability to convey information in written form as well as orally is one of humankind's greatest assets. The discovery that information can be shared across time and space, without the limits of the strength of one's voice, the size of a venue and the accuracy of memory, has been fundamental to human progress. And yet, learning how to read and write requires effort because it cannot be achieved without mastering a collection of complex skills. The brain is biologically



primed to acquire language, but writing and reading are relatively recent achievements in human history. Becoming a proficient reader is a goal that requires practice and dedication.”²⁹

²⁹ Source: OECD. (2010). *PISA 2009 Results: What Students Know and Can Do: Student Performance in Reading, Mathematics and Science*, Vol 1, p.18. OECD: Paris.



Mathematical Literacy (minor focus)



What aspects of mathematical literacy does PISA measure and report on?

PISA measures³⁰ student performance on four mathematical knowledge domains (clusters of relevant mathematical areas and concepts): *quantity* (related to number), *change and relationships* (related to algebra), *space and shape* (related to geometry) and *uncertainty* (related to statistics). The competencies *reproduction* (simple mathematical operations), *connections* (bringing together ideas to solve straightforward problems) and *reflection* (wider mathematical thinking) are also assessed. Because mathematical literacy is a minor domain of PISA 2009, results are only reported on students' mean performance on the

mathematical literacy scale³¹ and mathematical proficiency levels.

The mathematical literacy framework was established in PISA 2003 when mathematics was the main focus of PISA.³² The results from this 2009 administration can be compared with those from PISA 2006 and PISA 2003, but not with PISA 2000 when only two content areas were assessed (*change and relationships* and *uncertainty*).

Students' mathematical results are compared to the mean performance across the average for the 34 OECD countries, as well as to countries with a student mean performance that was better than, or not statistically different to, that of New Zealand students.

³⁰ The PISA mathematical literacy framework has three dimensions: knowledge domains, competencies involved (all noted above), and situations or context (mathematics for personal, educational, occupational, scientific and public use).

³¹ The mathematical literacy scale was previously known as the combined mathematical literacy scale.

³² Although mathematical literacy was assessed in PISA 2000, the mathematical literacy framework was expanded for the PISA 2003 administration.



Figure 5: What the mathematical literacy proficiency measures

Level	Lower score limit	Characteristics of tasks
6	669	At Level 6 students can conceptualise, generalise, and utilise information based on their investigations and modelling of complex problem situations. They can link different information sources and representations and flexibly translate among them. Students at this level are capable of advanced mathematical thinking and reasoning. These students can apply this insight and understandings along with a mastery of symbolic and formal mathematical operations and relationships to develop new approaches and strategies for attacking novel situations. Students at this level can formulate and precisely communicate their actions and reflections regarding their findings, interpretations, arguments, and the appropriateness of these to the original situations.
5	607	At Level 5 students can develop and work with models for complex situations, identifying constraints and specifying assumptions. They can select, compare, and evaluate appropriate problem solving strategies for dealing with complex problems related to these models. Students at this level can work strategically using broad, well-developed thinking and reasoning skills, appropriate linked representations, symbolic and formal characterisations, and insight pertaining to these situations. They can reflect on their actions and formulate and communicate their interpretations and reasoning.
4	545	At Level 4 students can work effectively with explicit models for complex concrete situations that may involve constraints or call for making assumptions. They can select and integrate different representations, including symbolic, linking them directly to aspects of real-world situations. Students at this level can utilise well-developed skills and reason flexibly, with some insight, in these contexts. They can construct and communicate explanations and arguments based on their interpretations, arguments, and actions.
3	482	At Level 3 students can execute clearly described procedures, including those that require sequential decisions. They can select and apply simple problem solving strategies. Students at this level can interpret and use representations based on different information sources and reason directly from them. They can develop short communications reporting their interpretations, results and reasoning.
2	420	At Level 2 students can interpret and recognise situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures, or conventions. They are capable of direct reasoning and making literal interpretations of the results.
1	358	At Level 1 students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are obvious and follow immediately from the given stimuli.

Source: OECD, (2004). *PISA 2003: Learning for Tomorrow's World – First Results from PISA 2003*. Paris: OECD.



Five OECD countries and six non-OECD partner countries or economies performed better than New Zealand, four OECD countries were similar, and the other 49 countries had a significantly lower performance.

Student performance in mathematics

Mathematical literacy scale

To provide an ongoing high-level picture of student performance in mathematical literacy, students' results on the tasks that cover the three dimensions (knowledge domains, competencies and context or situation) were summarised on an overall *mathematical literacy scale*.

The mean mathematical literacy performance of the 65 participating countries or economies and the percentage of students on each of the proficiency levels are shown in Figure 6.

Mean scores by country comparisons on the mathematical literacy scale

New Zealand's 15-year-olds performed strongly in mathematical literacy, achieving a mean score of 519 points. This was better than the OECD average (496).

- Fifteen-year-olds in five OECD countries – Korea (546), Finland (541), Switzerland (534), Japan (529) and Canada (527) – and in six non-OECD partner countries or economies – *Shanghai-China (600), *Singapore³³ (562), *Hong Kong-China (555), *Chinese Taipei (543), *Liechtenstein (536) and *Macao-China (525) – achieved higher mean scores than New Zealand's students.
- The mean performance of New Zealand's students was similar to four OECD countries: the Netherlands (526), Belgium (515), Australia (514) and Germany (513).

- New Zealand students outperformed their peers in 49 of the 64 other participating countries or economies, including the United Kingdom (492), the United States (487) and 22 of the other 33 OECD member countries.

Proficiency levels (six levels) by all students on the mathematical literacy scale

Mathematical proficiency is reported on a continuum spanning six levels. A full description of the types of tasks that students reaching a particular level in mathematical literacy can typically do is shown in Figure 5: What the mathematical literacy proficiency measures.

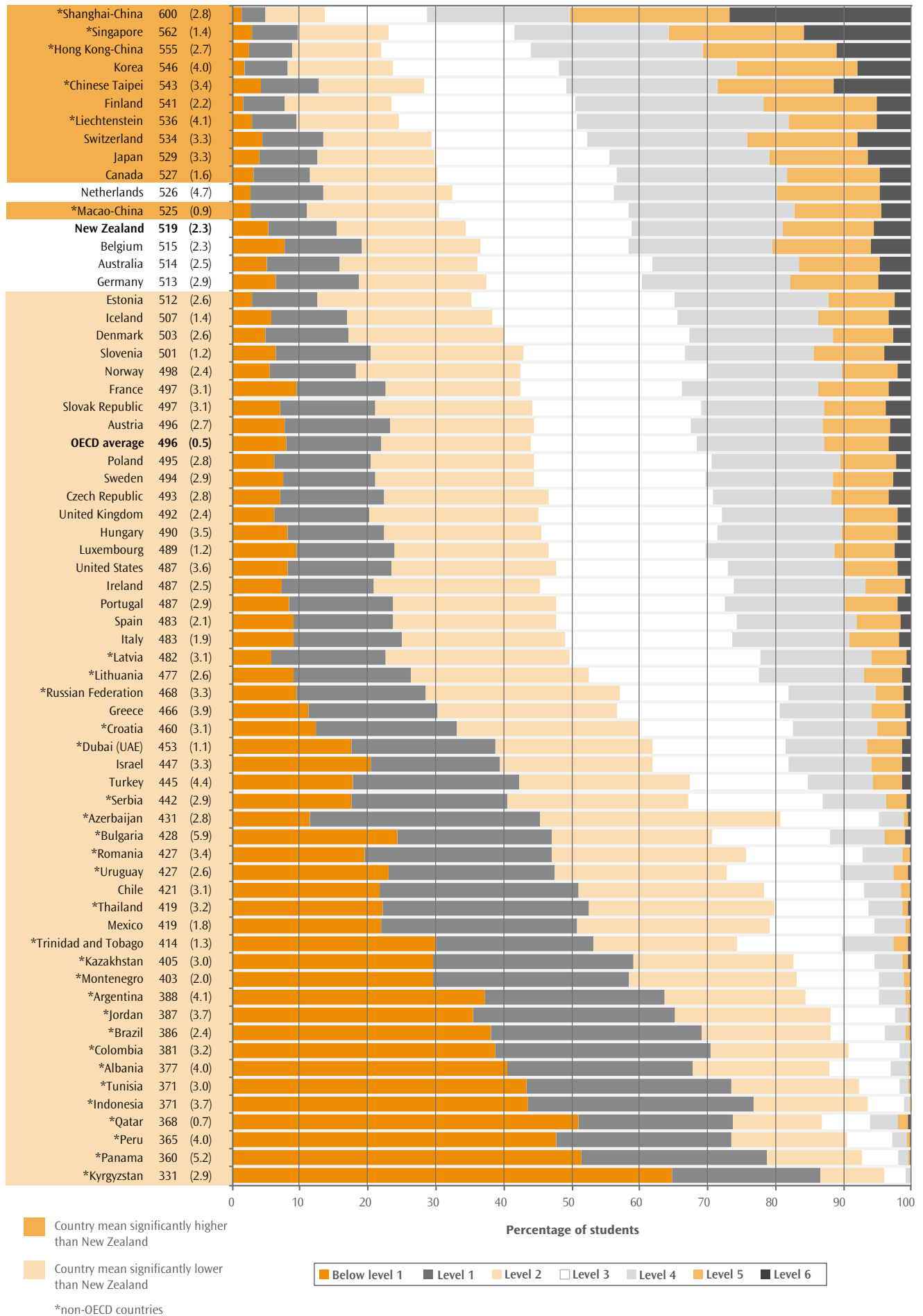
Level 6 (scores above 668 points) and **Level 5** (scores from 607 to 668 points)

Level 6 students demonstrated that they are capable of advanced mathematical thinking and reasoning. For example, students at this level can model complex problem situations and have a mastery of symbolic and formal mathematical operations.

Students achieving Level 5 or higher are also described by PISA as top-achieving students because they demonstrated that they are capable of developing and working with models in complex situations.

- *Shanghai-China had the largest proportion of students at the highest proficiency level, with more than a quarter (27%) of students achieving Level 6. At least 10 percent of the students from *Singapore (16%), *Chinese Taipei (11%) and *Hong Kong-China (11%) performed at this level, and in Korea and Switzerland eight percent did so.

33 *Shanghai-China and *Singapore are new PISA participants.

Figure 6: Mathematical literacy proficiency levels

- In New Zealand, five percent of our 15-year-olds achieved the highest proficiency level. This proportion was similar to Japan (6%), Belgium (6%), *Liechtenstein (5%), Finland (5%), Germany (5%), Australia (4%), the Netherlands (4%), Canada (4%) and *Macao-China (4%). A smaller percentage of students were at this level in the United Kingdom (2%) and the United States (2%). The average for the 34 OECD countries was three percent.
- In *Shanghai-China (50%), half of their 15-year-olds were at Level 5 or higher, and at least a quarter of students were at these levels in *Singapore (36%), *Hong Kong-China (31%), *Chinese Taipei (29%), Korea (26%) and Switzerland (24%).
- In the remaining top- or high-performing countries, including New Zealand (19%), around twenty percent were top performers (ie, at Level 5 or 6 mathematical proficiency): Finland (22%), Japan (21%), Belgium (20%), the Netherlands (20%), Canada (18%), *Liechtenstein (18%), Germany (18%), *Macao-China (17%) and Australia (16%).
- Proportionally fewer students were at Level 5 or higher in the United Kingdom (10%) and the United States (10%) than in New Zealand. The average across OECD countries was 13 percent.

Level 4 or higher (scores above 545 points)

Students achieving Level 4 were required to demonstrate that they can also work effectively with complex mathematical models, but only in explicit and concrete situations.

- At Level 4 or higher, 41 percent of New Zealand students were proficient in mathematical literacy. This proportion was similar to Japan (44%), the Netherlands (44%), Canada (43%), *Macao-China (42%), Belgium (42%), Germany (40%) and Australia (38%).
- In *Shanghai-China, close to three-quarters of students (71%) were at these levels, and in *Singapore (58%), *Hong Kong-China (56%), Korea (52%), *Chinese Taipei (51%), Finland (49%), *Liechtenstein (49%) and Switzerland (48%) there were around half or more.
- The proportion of 15-year-olds in the United Kingdom (28%) and the United States (27%) performing at Level 4 or above was substantially smaller than in New Zealand. This was also the case for the average of the 34 OECD countries (32%).

Level 1 (scores from 358 to 419 points) **or below** (scores below 358 points)

Students showing proficiency at Level 1 demonstrated that they can typically answer questions involving familiar mathematical contexts and perform actions that are obvious and follow immediately from the given stimuli.

- Fewer than 10 percent were at Level 1 or below in *Shanghai-China (5%), Finland (8%), Korea (8%), *Hong Kong-China (9%) and *Liechtenstein (9%).
- In seven of the other top- or high-performing countries or economies, between 10 percent and 13 percent of their students were at Level 1 or below: *Singapore (10%), Canada (11%), *Macao-China (11%), Japan (12%), *Chinese Taipei (13%), the Netherlands (13%) and Switzerland (13%).
- Fifteen percent of New Zealand students were at the lowest mathematical literacy levels, with 10 percent at Level 1 and five percent below Level 1. These proportions are similar to Australia (11% at Level 1, 5% below Level 1).
- Larger proportions were at Level 1 or below in Germany (19%), Belgium (19%), the United Kingdom (20%) and the United States (23%). The average for the OECD countries was 22 percent.

At least half of the top-performing countries or economies are East Asian, with Shanghai-China again outperforming the other 64 PISA participants.

Although New Zealand's 15-year-olds continued to show a strong performance in mathematical literacy, as measured by PISA, New Zealand had a smaller percentage of students performing at Level 6 than six other top- or high-performing countries or economies. Nevertheless, the proportion of New Zealand students performing at the highest proficiency level was similar to the nine other top- or high-performing countries or economies.

At the other end of the scale, the proportion of New Zealand students who were not proficient in mathematics at the baseline (Level 2) was similar to Australia and smaller than the OECD average, the United Kingdom and the United States. However, the majority of the other top- or high-performing countries or economies had proportionally fewer students at the low levels.



Mean scores by gender on the mathematical literacy scale

- Although New Zealand's boys (523) achieved a higher mean score than its girls (515), there was no statistically significant difference between the scores. In more than half of the participating countries or economies (35), boys outperformed girls, including Australia (boys 519, girls 509). The average across all OECD countries was boys 501, girls 490.
- In 10 of the 15 other top- or high-performing countries or economies, boys outperformed girls in mathematical literacy. In the other five there were no gender differences.
- Across all of the countries or economies participating in PISA 2009, a significant difference in favour of girls was found in five countries, all of which are non-OECD partner countries.

Proficiency levels by gender on the mathematical literacy scale

Level 6 (scores above 668 points) and Level 5 (scores from 607 to 668 points)

- *Shanghai-China (27%) and *Singapore (17%) had the largest proportions of boys performing at Level 6; *Hong Kong-China (13%) and *Chinese Taipei (13%) achieved more than twelve percent of boys at this level. These four East-Asian non-OECD partner countries or economies, along with Korea (boys 9%, girls 7%), achieved a substantially larger proportion of girls, compared to other countries, at Level 6 (*Shanghai-China 26%, *Singapore 14%, *Hong Kong-China 9% and *Chinese Taipei 10%).
- The proportion of New Zealand boys (7%) and girls (4%) performing at Level 6 was similar to the remaining top- or high-performing countries; examples are Japan (boys 8%, girls 5%), Finland (boys 6%, girls 4%) and Canada (boys 6%, girls 3%).
- Half of the boys and half of the girls in *Shanghai-China (boys 50%, girls 51%) were among the top performers who achieved at Level 5 or higher.
- In New Zealand, the proportion of boys (21%) and girls (16%) at Level 5 or higher was smaller than in *Singapore (boys 37%, girls 34%), *Hong Kong-China (boys 34%, girls 27%), *Chinese Taipei (boys 31%, girls 26%), Korea (boys 28%, girls 23%) and Switzerland (boys 28%, girls 20%).

New Zealand girls and boys achieved a similar mean mathematical literacy performance.



Level 4 or higher (scores above 545 points)

- The proportion of New Zealand's boys (43%) at Level 4 or higher (the combination of Levels 4, 5 and 6) was larger than that found for girls (39%). This was similar to seven other top- or high-performing countries, including Japan (boys 46%, girls 40%), Canada (boys 46%, girls 40%) and Australia (boys 41%, girls 36%).
- The proportions of New Zealand boys and girls at these levels were smaller than in seven of the top- or high-performing countries. *Shanghai-China (boys 70%, girls 72%) had the largest proportion of both boys and girls achieving at Level 4 or higher. *Singapore (boys 60%, girls 57%), *Hong Kong-China (boys 59%, girls 53%) and Korea (boys 53%, girls 51%) all had at least half of their boys and half of their girls at Level 4 or higher.

Level 1 (scores from 358 to 420 points) or below (scores less than 358 points)

- A similar proportion of New Zealand's 15-year-old girls (15%) and boys (16%) were proficient at the lowest levels of mathematical literacy, with around five percent of these students from both gender groupings not achieving Level 1.
- The proportion of New Zealand boys at this level was similar to five other top- or high-performing countries, including Australia (15%), but was greater than in the remaining 10 ie remaining 10 top- or high-performing countries or economies, such as *Shanghai-China (5%) and Finland (8%).
- Among the top- or high-performing countries or economies, Germany (20%) and Belgium (21%) had higher proportions of girls at Level 1 or below compared to New Zealand. Australia (16%) and three other top- or high-performing countries had

similar proportions of girls at this level, while the remaining top- or high-performing countries or economies had smaller proportions; for example, *Shanghai-China (4%) and Korea (7%).

Although there was no statistical difference between the mathematical performance of New Zealand's boys and girls, proportionally more boys than girls showed an advanced level of mathematical proficiency. In PISA 2006 there was a small but significant difference in favour of boys (11 points).

Mean scores by ethnic group/s on the mathematical literacy scale³⁴

As noted earlier, students taking part in PISA were asked to provide information about the ethnic group/s they belonged to. Students who belonged to more than one group were counted in each group they identified.

- Students who identified as belonging to Pākehā/European (537) or Asian ethnic groups (529) performed strongly in mathematical literacy, achieving a score above the OECD average.
- The mean mathematical literacy score for students who identified as Māori (476) or Pasifika (446) was lower than the OECD mean (496).

Proficiency level by ethnic group/s on the mathematical literacy scale

Level 6 (scores above 668 points) **and Level 5** (scores from 607 to 668 points)

- Seven percent of Asian students and six percent of Pākehā/European students were proficient at the highest level of mathematical literacy, Level 6. A small proportion of Māori (2%) and Pasifika (1%) students were also successful at this level.
- Over 20 percent of Asian (23%) and Pākehā/European (22%) students were proficient at Level 5 or higher. Eight percent of Māori and five percent of Pasifika students belonging to these groups reached this level of performance.

Level 4 or higher (scores above 545)

- Close to half of Pākehā/European (48%) students reached Level 4 or higher; the proportion of Asian

students (44%) was slightly less. Proportionally fewer Māori (22%) and Pasifika (14%) students reached Level 4 or higher than the average for the OECD (32%).

Level 1 (scores from 358 to 420 points) **or below** (scores less than 358 points)

- Ten percent of Pākehā/European and 14 percent of Asian students were at Level 1 or lower. Twenty-seven percent of Māori students and 40 percent of Pasifika students were at these levels.

³⁴ As noted earlier, the reporting of total ethnicity data is consistent with the Statistics New Zealand standard, but differs from the prioritised classification method used in previous PISA reporting (2000, 2003 and 2006) and many other Research Division reports. As part of this transition, mean scores by ethnic group have also been analysed using the prioritisation classification method: Māori (476), Pasifika (442), Asian (533) and Pākehā-European (542).



New Zealand's 15-year-olds mean mathematical literacy performance did not change between 2003 and 2009.

“

Changes in mathematical literacy performance Between 2003 and 2009

Because the measure for mathematics has remained consistent since PISA 2003, it is possible to look at changes in 15-year-olds' performance in mathematical literacy since 2003. Forty countries or economies participated in both PISA 2003 and 2009 administrations, and 28 of these were OECD member countries.³⁵

Mean scores by country comparisons between 2003 and 2009

- There was no statistically significant change in New Zealand's 15-year-olds' mathematical literacy performance between 2003 and 2009.
- More than half (24 countries) of the 39 countries or economies that have participated in both PISA 2003 and 2009 did not show a statistically significant change in mathematical literacy over the six-year period. This includes the OECD and non-OECD partner countries or economies that performed better than New Zealand in PISA 2009 (Finland, Canada, Japan, Korea and Switzerland; and the non-OECD partner country and economies, *Hong Kong-China, *Liechtenstein and *Macao-China). There was also no change for the United States.
- The mean mathematical performance of 10 countries, including three PISA 2003 top- or high-performing countries Belgium (-14), the Netherlands

(-12) and Australia (-10), showed a statistically significant decrease over the six-year period.

- In contrast, Germany's 15-year-olds' mean mathematical performance improved by 10 points. Seven other countries also showed a large improvement, although the mean performance of these countries in 2003 was far below the OECD average, and was still below the average six years later.

Proficiency levels by country comparisons between 2003 and 2009

Level 5 or higher (scores above 607 points)

- There was no change between 2003 and 2009 in the proportion of New Zealand students who were proficient in mathematics at Level 5 or higher.
- Portugal (+4%), Italy (+2%) and Greece (+2%) were the only countries to show a statistically significant increase in the proportion of students achieving the highest levels.
- Ten countries showed a statistically significant reduction since 2003 in the proportion of their top performers, with the Czech Republic (-7%), Belgium (-6%), the Netherlands (-6%) and Ireland (-5%) showing a reduction of five percent or more at these levels. Sweden (-4%), Denmark (-4%), Australia (-3%), Canada (-2%) and Iceland (-2%), and the non-OECD partner country *Latvia (-2%), all showed a smaller proportion of top performers. The average across the 29 OECD countries also showed a small, but statistically significant, reduction (-1%).

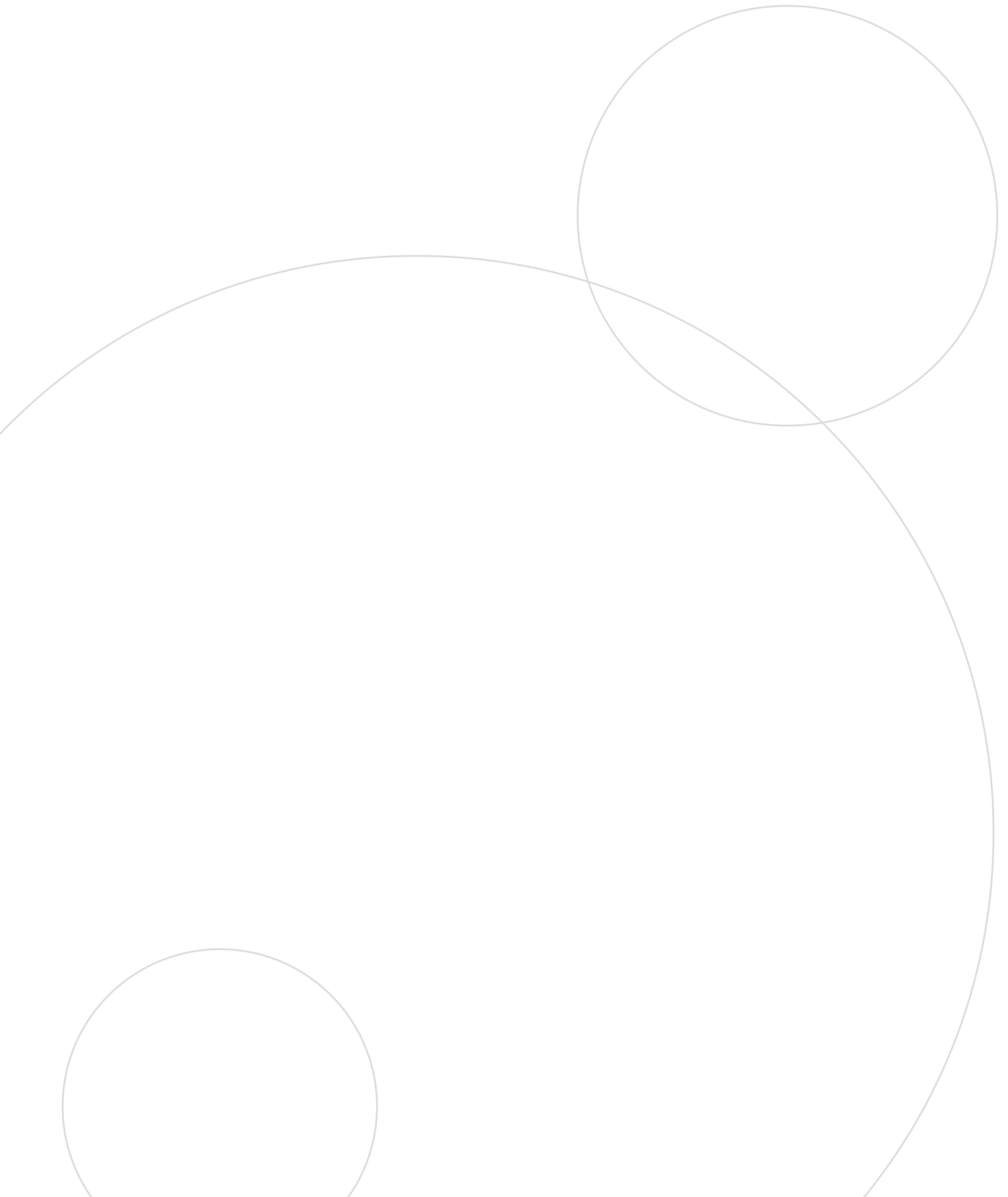
³⁵ Because the United Kingdom's PISA 2003 sample did not meet the PISA established technical standards for the quality of data sets, their results have been treated as missing. For further detail see, OECD (2005). PISA 2003 Technical Report. OECD: Paris.

As for reading, the comparability of Austria's 2009 data with the data from previous cycles cannot be ensured. This is because of education disputes in Austria at the time of the PISA 2009 assessment.

Level 1 or lower (*scores below 420 points*)

- At the lower end of the scale there was no change in the proportion of New Zealand students who did not achieve proficiency above Level 1. This was the case for all top- or high-performing countries or economies except for Belgium, where a larger proportion of students were at these lower levels in this administration of PISA than in PISA 2003.
- France (+6%), the Czech Republic (+6%), Austria (+4%), Ireland (+4%), Sweden (+4%) and Belgium (+3%) had proportionally more students at these lower levels than in 2003. Small increases in the proportion of students at the lower levels were also found in Luxembourg (+2%) and Iceland (+2%).
- Seven countries, all with a mean performance lower than the OECD mean in PISA 2003 and 2009, showed a reduction in the proportion of students who were not proficient in mathematics above Level 1. Mexico (-15%) and Turkey (-15%) showed a reduction of 10 percent or more, and Greece (-9%), Italy (-7%), Portugal (-6%), *Brazil (-6%) and *Tunisia (-4%) all had proportionally fewer students at the lower levels.

In summary, New Zealand's 15-year-old mathematical mean performance did not change over the six years. Germany was the only country that performed above the 2003 PISA OECD mean where performance improved. Conversely, three high performing countries mathematical literacy performance decreased.





Scientific Literacy (minor focus)



What aspects of scientific literacy does PISA 2009 measure and report on?

PISA measures student performance in scientific literacy in three scientific competencies – *identifying scientific issues, explaining phenomena scientifically and using scientific evidence* – and two scientific knowledge areas – *knowledge of science and knowledge about science*.³⁶ Because scientific literacy is a minor domain in this round of PISA, results are reported only on students' mean performance on the *scientific literacy scale*³⁷ and scientific proficiency levels.

Scientific literacy was assessed in PISA 2000 and 2003 as a minor domain. In 2006, when scientific literacy was the main focus of PISA, the framework was further developed and established as a basis for measuring trends. Results from this PISA administration are therefore comparable with PISA 2006 results only.

Student results are compared to the mean performances across the average for 34 OECD countries, as well as the countries with a student scientific literacy mean performance that was either better than, or not statistically not different to, that of New Zealand students.

³⁶ The PISA scientific literacy framework has three dimensions: knowledge domains, competencies involved (all noted above) and situations (personal, social and global).

³⁷ The scientific literacy scale was previously known as the combined scientific literacy scale.

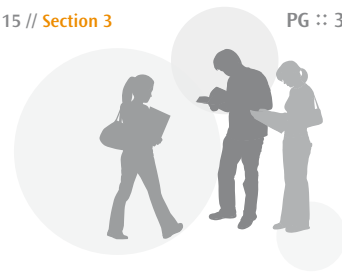


Figure 7: What the scientific literacy proficiency levels measure

Level	Lower score limit	Characteristics of tasks
6	708	At Level 6, students can consistently identify, explain and apply scientific knowledge and knowledge about science in a variety of complex life situations. They can link different information sources and explanations and use evidence from those sources to justify decisions. They clearly and consistently demonstrate advanced scientific thinking and reasoning, and they demonstrate willingness to use their scientific understanding in support of solutions to unfamiliar scientific and technological situations. Students at this level can use scientific knowledge and develop arguments in support of recommendations and decisions that centre on personal, social or global situations.
5	633	At Level 5, students can identify the scientific components of many complex life situations, apply both scientific concepts and knowledge about science to these situations, and can compare, select and evaluate appropriate scientific evidence for responding to life situations. Students at this level can use well-developed inquiry abilities, link knowledge appropriately and bring critical insights to situations. They can construct explanations based on evidence and arguments based on their critical analysis.
4	559	At Level 4, students can work effectively with situations and issues that may involve explicit phenomena requiring them to make inferences about the role of science or technology. They can select and integrate explanations from different disciplines of science or technology and link those explanations directly to aspects of life situations. Students at this level can reflect on their actions and they can communicate decisions using scientific knowledge and evidence.
3	484	At Level 3, students can identify clearly described scientific issues in a range of contexts. They can select facts and knowledge to explain phenomena and apply simple models or inquiry strategies. Students at this level can interpret and use scientific concepts from different disciplines and can apply them directly. They can develop short statements using facts and make decisions based on scientific knowledge.
2	409	At Level 2, students have adequate scientific knowledge to provide possible explanations in familiar contexts or draw conclusions based on simple investigations. They are capable of direct reasoning and making literal interpretations of the results of scientific inquiry or technological problem solving.
1	335	At Level 1, students have such a limited scientific knowledge that it can only be applied to a few, familiar situations. They can present scientific explanations that are obvious and that follow explicitly from given evidence.

Source: OECD, (2007). PISA 2006: *Scientific Competencies for Tomorrow's World*, Vol 1. Paris OECD.



Only one OECD country and three non-OECD partner countries achieved a higher mean scientific literacy score than New Zealand. Six OECD countries were similar, and the other 54 countries performed significantly lower.

Student performance in science

Scientific literacy scale

Student performance on the various aspects of scientific literacy in PISA 2009 is summarised on the scientific literacy scale to provide an ongoing high-level picture of student performance.

The mean scientific literacy performance of the 65 participating countries or economies and the percentage of students on each of the proficiency levels are shown in Figure 8.

Mean scores by country comparisons on the scientific literacy scale

Overall, New Zealand's 15-year-old students performed very strongly in scientific literacy, scoring 532 points. This was substantially better than the OECD average (501).

- Of the 65 countries participating in PISA 2009, only one OECD country, Finland (554), and three non-OECD partner countries or economies, *Shanghai-China³⁸ (575), *Hong Kong-China (549) and *Singapore (542), achieved a significantly better mean performance than New Zealand.
- New Zealand students' mean performance was not statistically different from that of six other OECD countries: Japan (539), Korea (538), Canada (529), Estonia (528), Australia (527) and the Netherlands (522).

- On average, New Zealand's 15-year-olds achieved a statistically better performance than 54 of the other countries participating in PISA, including the United Kingdom (514), the United States (502), and 27 of the 33 other OECD countries.

Proficiency levels (six levels) by all students on the scientific literacy scale

Scientific proficiency is also reported on a continuum spanning six levels. A full description of the types of tasks that students reaching a particular level in scientific literacy can typically do is shown in Figure 7: What the scientific literacy proficiency measures.

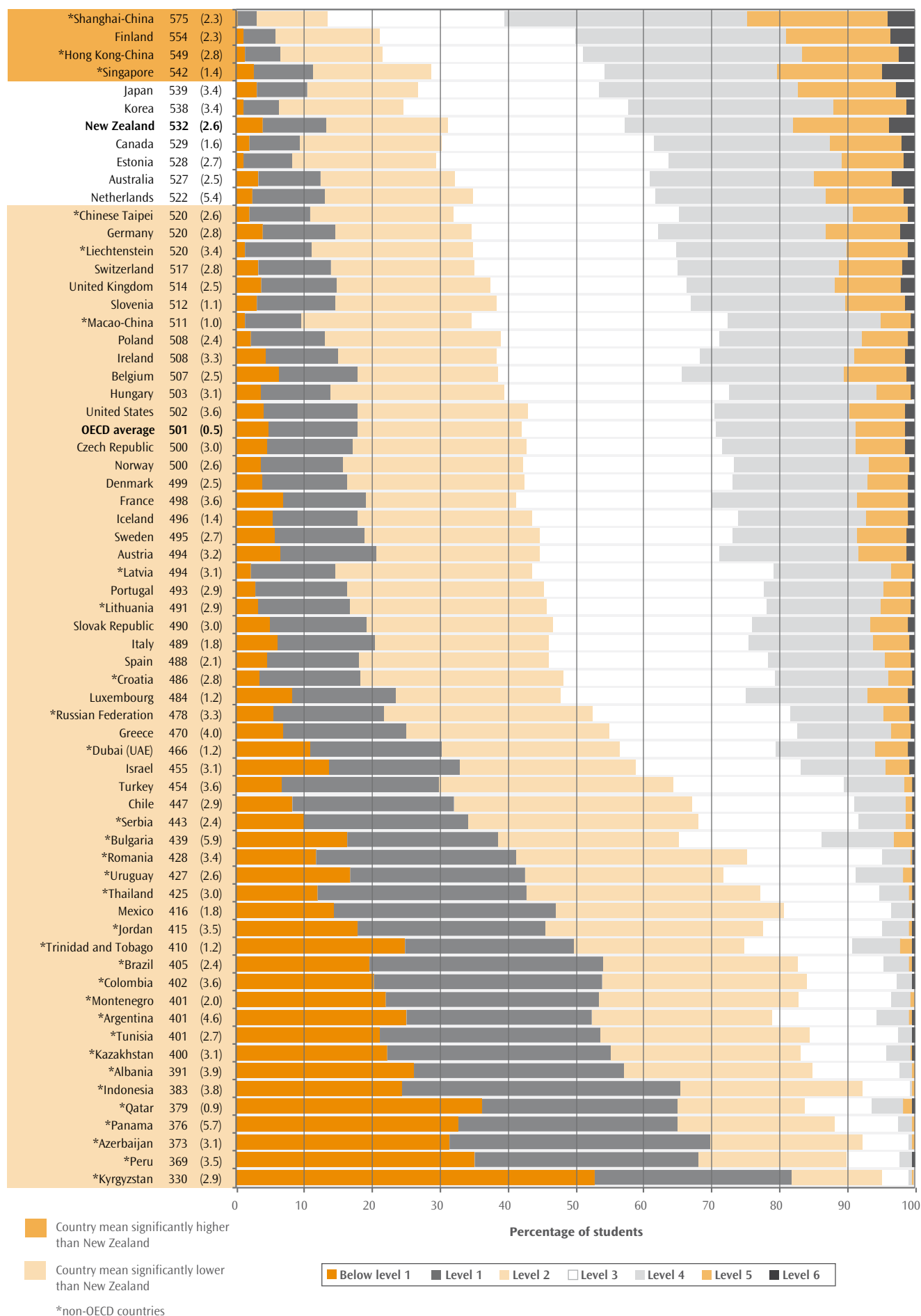
Level 6 (scores above 708 points) **and Level 5** (scores from 633 to 708 points)

Students at the highest scientific proficiency level, Level 6, clearly demonstrated that they have advanced scientific thinking and reasoning. For example, these students showed that they can use their scientific knowledge to provide solutions to unfamiliar scientific situations.

Students achieving at Level 5 are also described as top performers because they were required, for example, to demonstrate that they have the ability to identify the scientific components of many complex life situations.

- *Singapore achieved the largest proportion (5%) of students achieving at the highest level of scientific proficiency (Level 6), followed by *Shanghai-China, New Zealand (both with 4%), Finland, Australia and Japan (all with 3%).

38 As noted earlier, both *Shanghai-China and *Singapore are new PISA participants.

Figure 8: Scientific literacy proficiency levels

- In the remaining top- or high-performing countries or economies, two percent of students achieved Level 6 in *Hong Kong-China and Canada, and one percent did so in the Netherlands, Estonia and Korea.
- Two non-OECD partner participants, *Shanghai-China (24%) and *Singapore (20%), along with Finland (19%) and New Zealand (18%), had at least twice as many students at Level 5 or higher than the average for the 34 OECD countries (9%).
- The other eight high-performing countries achieved 10 percent or more students at this level (Australia 15%, Canada 12%).
- Thirteen percent of New Zealand's students did not show scientific proficiency at the baseline level (Level 2). Canada (10%), Japan (11%), the Netherlands (13%), Australia (13%), and *Singapore (11%) all had 10 percent or more students at this level.
- In *Shanghai-China (3%), Finland (6%), Korea (6%), *Hong Kong-China (7%) and Estonia (8%) a relatively small proportion were at Level 1 or below.
- Across the OECD countries and in the United States, 18 percent of students did not achieve above Level 1, and in the United Kingdom 15 percent did not achieve at this level.

Level 4 or higher (scores above 559 points)

Students achieving Level 4 also showed a strong level of proficiency. For example, these students showed that they are capable of linking scientific knowledge appropriately and bringing critical insights to situations.

- Although 60 percent of students from *Shanghai-China achieved at least Level 4, there were over 40 percent of students at these levels in six of the eleven top- or high-performing countries or economies, including New Zealand (43%), Finland (50%), *Hong Kong-China (49%), Japan (46%), *Singapore (46%) and Korea (42%). In Australia (39%), Canada (38%), the Netherlands (38%), Estonia (36%), the United Kingdom (34%) and the United States (29%) there were fewer than 40 percent of students at these levels. The average for the OECD countries was 29 percent.

Level 1 (scores from 335 to 409 points) **or below** (scores less than 335 points)

Students at Level 1 have limited scientific knowledge. However, they demonstrated that they are capable of presenting scientific explanations that are obvious.

- Four percent of New Zealand's 15-year-olds did not show scientific literacy at Level 1 (ie, they were below Level 1). Three other top- or high-performing countries – Australia (3%), Japan (3%) and the Netherlands (3%) – had a similar proportion of students as New Zealand not reaching Level 1.
- When compared with the OECD average (5%), New Zealand had a similar proportion below Level 1. In the remaining five top- or high-performing countries or economies, with the exception of Canada (2%) and *Singapore (3%), only one percent or fewer 15-year-olds did not achieve at least Level 1.

Finland's 15-year-olds were the only OECD students to outperform New Zealand's students on average in scientific literacy. Nevertheless, *Shanghai-China's 15-year-olds clearly stand out from every participating country or economy, with a mean performance that was at least 20 points higher than any other participating country or economy.

As found in the last administration of PISA, close to one in five of New Zealand students are doing exceptionally well in science (they are capable of advanced scientific thinking and reasoning).

The proportion of New Zealand students with low proficiency was similar to that in some other high-performing countries. However, as was also found in PISA 2006, when considering the proportion of New Zealand students achieving at the high levels of scientific proficiency, the number not achieving beyond Level 1 is disproportionately large.

Mean scores by gender on the scientific literacy scale

- Although New Zealand's girls (535) showed a six-point advantage over boys (529), this difference was not statistically significant. The average difference between girls and boys across the 34 OECD member countries was also not statistically different (girls 499, boys 501).
- New Zealand's boys achieved a similar mean science result as their peers in the six other high-performing countries, although boys from the four top-performing countries or economies achieved a better result.
- New Zealand's girls achieved a significantly better result than girls from two of the high-performing countries, Canada (526) and the Netherlands (520), and, as found for boys, girls from the four top-



performing countries or economies outperformed New Zealand's girls.

- Eight of the thirty-four OECD countries showed an advantage for boys in science, including the United States (14 points) and the United Kingdom (9 points). One top- and one high- performing OECD country, Finland (15 points) and Japan³⁹ (12 points), showed more than 10 score points in favour of girls. A further four OECD countries also showed an advantage for girls (Slovenia, Turkey, Greece and Poland).

Proficiency levels (six levels) by gender on the scientific literacy scale

Level 6 (scores above 708 points) **and Level 5** (scores from 633 to 708 points)

- A slightly larger proportion of New Zealand's 15-year-old boys (4%) achieved at the highest level (Level 6) than their female counterparts (3%).
- New Zealand, along with *Singapore (5%), *Shanghai-China (5%) and Australia (4%), had the largest proportion of boys achieving at the highest scientific literacy proficiency level.
- Three percent of New Zealand girls achieved Level 6. In *Singapore (4%), Finland (3%), *Shanghai-China (3%), Australia (3%) and Japan (2%), the proportions were similar to New Zealand's. However, *Hong Kong-China (2%), Estonia (1%), the Netherlands (1%) and Canada (1%) had a smaller proportion than New Zealand at the highest level.
- Close to one in five of New Zealand's boys (19%) were successful at Level 5 or higher; the proportion of girls (16%) was slightly smaller than for boys, but not statistically so.
- *Shanghai-China (23%), Finland (20%) and *Singapore (19%) were the only other countries or economies to have proportionally more girls than New Zealand at Level 5 or higher. Only the partner economy *Shanghai-China (26%) had a larger proportion of boys at these levels.

Level 4 or higher (scores above 559 points)

- There was no difference in the proportion of New Zealand's 15-year-old boys (43%) and girls (43%) proficient in science at Level 4 or higher.

New Zealand girls and boys achieved a similar mean scientific literacy performance.

- Only *Shanghai-China (60%) and *Hong Kong-China (50%) had proportionally more boys achieving at Level 4 or higher than New Zealand (43%).
- *Shanghai-China (61%) and *Hong Kong-China (48%) also had a larger proportion of girls than New Zealand at Level 4 or higher, along with Japan (48%) and Finland (46%). However, in Australia (38%) and Canada (37%), there were smaller proportions of girls at these levels; this was not the case for boys.
- Smaller proportions of boys and girls were at Level 4 or higher across the 34 OECD countries (boys 30%, girls 28%) than in New Zealand. This was also the case in the United Kingdom (boys 36%, girls 31%) and the United States (boys 33%, girls 26%).
- Among the top and high-performing countries or economies, Canada was the only country to show a larger proportion of boys (40%) than girls (37%) at these levels. Conversely, Finland was the only top- or high-performing country or economy to show a larger proportion of girls (54%) than boys (46%) at these levels.

Level 1 (scores from 335 to 409 points) **or below** (scores less than 335 points)

- A larger proportion of New Zealand's boys (16%) than girls (11%) did not show proficiency at Level 1 or below. Five percent of these boys and three percent of these girls did not show proficiency at Level 1.
- In four of the 10 other top- or high-performing countries or economies there were also 10 percent or more boys or girls who did not succeed above Level 1: Australia (boys 14%, girls 11%), the Netherlands (boys 14%, girls 12%), Japan (boys 13%, girls 8%) and *Singapore (boys 10%, girls 12%).

³⁹ The gender difference in Japan was not significant due to the relatively large standard error.

- On average across the OECD countries, 19 percent of boys and 17 percent of girls were at Level 1 or below, and five percent of these girls and five percent of these boys did not achieve Level 1.

Overall, a larger proportion of New Zealand boys than girls were at the lower scientific proficiency levels. However, at the high end of the proficiency continuum, boys were slightly more likely to display exceptional scientific knowledge and skills; that is, top performers who achieved at either Level 5 or Level 6.

Mean scores by ethnic group/s on the scientific literacy scale⁴⁰

- Students identifying as Pākehā/European (mean score 555) had, on average, a very strong performance in scientific literacy. Students identifying as Asian (530) also performed strongly, achieving a mean score significantly above the OECD average.
- The mean performance of Māori (487) or Pasifika (448) students was lower than the OECD mean (501).

Proficiency levels by ethnic group/s on the scientific literacy scales

Level 6 (scores above 708 points) and Level 5 (scores from 633 to 708 points)

- Fewer than five percent of students from any ethnic group achieved Level 6, the highest scientific proficiency level: Pākehā/European 4 percent, Asian 4 percent, Māori 2 percent and Pasifika 1 percent.
- At least one in five Pākehā/European students (21%) successfully completed tasks at Level 5 or higher. A broadly similar proportion of Asian students (17%) were at this level. The proportions of Māori (8%) and Pasifika (4%) students achieving at these levels were smaller.

Level 4 or higher (scores above 559 points)

- Half of Pākehā/European (51%) students were proficient at Level 4 or higher. Forty-one percent of Asian students, 24 percent of Māori students and 15 percent of Pasifika students also achieved at Level 4 or higher.

Level 1 (scores from 335 to 409 points) or below (scores less than 335 points)

- Fewer than 10 percent of Pākehā/European students (7%) were at Level 1 or lower. The proportions of students identifying as Asian (14%) and Māori (22%) not reaching these levels were larger. Thirty-eight percent of Pasifika students did not demonstrate proficiency beyond Level 1.
- Only a very small proportion of Pākehā/European students (2%) and Asian students (3%) did not show proficiency at Level 1. Six percent of Māori and 13 percent of Pasifika students did not reach this level.

⁴⁰ As noted earlier, the reporting of total ethnicity data is consistent with the Statistics New Zealand standard, but differs from the prioritised classification method used in previous PISA reporting (2000, 2003 and 2006) and many other Research Division reports. As part of this transition, mean scores by ethnic group have also been analysed using the prioritisation classification method: Māori (487), Pasifika (443), Asian (534) and Pākehā-European (560).



New Zealand's 15-year-olds mean performance in scientific literacy did not change between 2006 and 2009.

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Changes in scientific literacy performance Between 2006 and 2009

Because science was the main focus of PISA 2006, it is possible to look at changes in 15-year-olds' scientific literacy performance since 2006. Fifty-seven countries or economies participated in both the PISA 2006 and 2009 administrations, including the 34 OECD member countries.⁴¹

Mean scores by country comparisons between 2006 and 2009

- New Zealand's 15-year-olds' performance in scientific literacy showed no significant change between 2006 and 2009.
- Over the three-year period, 11 countries or economies showed an improvement and five a decrease in 15-year-olds mean scientific literacy performance.
- Among the six countries that showed an improvement, only two were those with mean scores in PISA 2006 that were either at or above the OECD mean: Korea (+16 points) and Poland (+16 points).
- Four of the five countries or economies that showed a decrease in average performance – Finland (-9), *Chinese Taipei (-12), (both PISA 2006 top- or high-performing countries), the Czech Republic (-12), and Slovenia (-7) – were those with a science mean score in PISA 2006 that was either at or above the PISA 2006 OECD mean. Montenegro (-11) also showed a decrease.

Proficiency levels by country comparisons between 2006 and 2009

Level 5 or higher (scores above 632 points)

- There was no change between 2006 and 2009 in the proportion of New Zealand students who were proficient in scientific literacy at Level 5 or higher.
- Only two countries, Italy (+1%) and *Qatar (+1%), both with a PISA 2006 mean performance that was lower than the OECD average, showed a significant increase in the proportion of students achieving at the highest levels.⁴²
- *Chinese Taipei (-6%), a high-performing country in PISA 2006, showed the largest decrease in the proportion of students reaching Level 5 or higher, followed by the Czech Republic (-3%), Slovenia (-3%), the United Kingdom (-2%), Canada (-2%) and Austria (-2%).⁴³

Level 1 or lower (scores below 335 points)

- There was no change over the three-year period in the proportion of New Zealand students who were at Level 1 or below in scientific literacy.
- Sweden (+3%), Montenegro (+3%) and Finland (+2%) were the only participating countries or economies that showed significant larger proportions of students with a Level 1 or

⁴¹ As for reading and mathematics, the comparability of Austria's 2009 data with the data from previous cycles cannot be ensured. This is because of education disputes in Austria at the time of the PISA 2009 assessment.

⁴² Japan (2%) and Korea (1%) had larger increases than Italy and Qatar, but the increases were not statistically significant.

⁴³ Finland and *Liechtenstein also showed a 2% decrease, but the decrease was not statistically significant. Chile (1%) showed a small, but statistically significant, decrease.

below scientific literacy proficiency in PISA 2006, compared to PISA 2009.⁴⁴

- Korea (-5%) was the only country with a mean scientific literacy performance that was above the PISA 2006 OECD mean to show a reduction in the proportion of students at these levels in PISA 2009, compared to PISA 2006.
- Fifteen other countries also achieved a reduction in the proportion of students Level 1 or below,

including the United States (-6%). The only countries to show a reduction of more than 10 percent of students at these levels were Turkey (-17%) and *Qatar (-14%).

In summary, New Zealand's 15-year-old scientific literacy mean performance did not change over the three years. Only one of the top- or high-performing countries' or economies performance improved, while two top- or high-performing showed a decrease.

⁴⁴ Indonesia also showed a 4% increase, but the increase was not statistically significant.

Finally

This report has focused on the key findings of New Zealand's student reading, mathematical and scientific literacy performance relative to the top and other high-performing countries or economies. New Zealand students continue to perform better than the majority of their international peers in all three literacy areas. Further results will be available in 2011. These look at the relationships between achievement and students' home background and school factors, as well as students' reading habits and reading strategies. Because students and principals complete a questionnaire the PISA study provides a wealth of information about 15-year-olds.

We are indebted to the 163 schools and their 15-year-olds who participated in the PISA 2009 main study, and to the staff who generously volunteered to coordinate this study for their school. Your efforts have provided New Zealand with a valuable resource.



Appendix 1: Reading literacy, mathematical literacy and scientific literacy: upper and lower country rankings (top- and high-performing country/economy comparisons)

Reading	OECD countries		All countries/economies	
	Upper rank	Lower rank	Upper rank	Lower rank
*Shanghai-China	~	~	1	1
Korea	1	2	2	4
Finland	1	2	2	4
*Hong Kong-China	~	~	3	4
*Singapore	~	~	5	6
Canada	3	4	5	7
New Zealand	3	5	6	9
Japan	3	6	5	9
Australia	5	7	8	10
Mathematics				
*Shanghai-China	~	~	1	1
*Singapore	~	~	2	2
*Hong Kong-China	~	~	3	4
Korea	1	2	3	6
*Chinese Taipei	~	~	4	7
Finland	1	3	4	7
*Liechtenstein	~	~	5	9
Switzerland	2	4	6	9
Japan	3	6	8	12
Canada	4	6	9	12
Netherlands	3	7	8	13
*Macao-China	~	~	10	12
New Zealand	6	8	12	14
Belgium	7	11	13	17
Australia	7	11	13	17
Germany	8	12	13	17
Science				
*Shanghai-China	~	~	1	1
Finland	1	1	2	3
*Hong Kong-China	~	~	2	3
*Singapore	~	~	4	6
Japan	2	3	4	6
Korea	2	4	4	7
New Zealand	3	6	6	9
Canada	4	7	7	10
Estonia	4	8	7	11
Australia	4	8	7	11
Netherlands	4	11	7	16

Notes

1. It is not possible to determine a precise ranking of a country's performance. However, it is possible to determine, with a 95% likelihood, the range of ranks in which a country's mean performance lies.
2. ~ OECD ranking is not applicable for non-OECD partner countries or economies.



Further information

More detailed information is available in the OECD PISA 2009 international reports (five volumes). These reports can be accessed from www.educationcounts.govt.nz/goto/pisa. An interactive data selection facility which allows selected analyses of international contextual information to student performance is also available from this site, along with the international versions of the student, school and parent questionnaires.

PISA will be administered in New Zealand again in 2012 during July and August. The PISA 2012 results will be published by the OECD in December 2013.

Definitions and technical notes⁴⁵

PISA 2009 literacy definitions

Reading Literacy: An individual's ability to understand, use, reflect on and engage with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society.

Mathematical Literacy: An individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgements, and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen.

Scientific Literacy: An individual's scientific knowledge and use of that knowledge to identify questions to acquire new knowledge, to explain scientific phenomena, and to draw evidence-based conclusions about science-related issues, understanding of the characteristic features of science as a form of human knowledge and enquiry, awareness of how science and technology shape our material, intellectual, and cultural environments, and willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen.

Technical Notes

Mean

Student performances in PISA are reported using means, which is a type of average, for groupings of students. In general, the mean of a set of scores is the sum of the scores divided by the number of scores, and is often referred to as 'the average'. Note that for PISA, as with other large-scale studies, the means for a country are adjusted slightly (in technical terms 'weighted') to reflect the total population of 15-year-olds rather than just the sample. Throughout this report, where appropriate, mean scores presented within the text usually appear in parentheses.

OECD mean or average

The OECD mean, sometimes referred to as the OECD average, includes only the OECD countries –non-OECD (partner) countries are not included in this average. The OECD mean is the average of the means for the OECD countries. An OECD mean score of 500 points was constructed for reading literacy overall in PISA 2000,

with about two-thirds of students across OECD countries scoring between 400 and 600 points. The reading literacy scale used for PISA 2009 is the same as PISA 2000; the lower PISA 2009 OECD mean (493) reflects the inclusion of new countries to the OECD as well as any changes in student performance over the nine years.

Percentile

The percentages of students performing below or above particular points on the scale can be used to describe the range of achievement. The lowest reported achievement is the 5th percentile – the score at which only 5 percent of students achieved a lower score – and 95 percent achieved a higher score. The highest reported achievement is the 95th percentile – the score at which only 5 percent of students achieved a higher score and 95 percent a lower score; thus 90 percent of the 15-year-old student scores lie between the 5th and 95th percentiles. The difference between the 5th and 95th percentiles provides a measure of the spread of scores.

Proficiency levels


































































PISA developed proficiency levels to describe the range in literacy across 15-year-old students. The proficiency levels describe the competencies of students achieving at that level and are anchored at certain score points on the achievement scale. Note that students were considered to be proficient at a particular level if, on the basis of their overall performance, they could be expected to answer at least half of the items in that level correctly. Typically, students who were proficient at higher levels had also demonstrated their abilities and knowledge at lower levels. The score points defining the proficiency levels and characteristics of tasks for each of the proficiency levels are provided in this report.

Statistically significant

In order to determine whether a difference between two means is actual, it is usual to undertake tests of significance. These tests take into account the means and the error associated with them. If a result is reported as not being statistically significant, then although the means might be slightly different, we do not have sufficient evidence to infer that they are different. All tests of statistical significance referred to in this report are at the 95 percent confidence level.

⁴⁵ For further information on the PISA assessment instruments and the methods used in PISA, see the PISA 2009 Technical Report (OECD, forthcoming) and the PISA website (www.pisa.oecd.org).

List of countries and economies participating in PISA 2009

 Albania*	 Argentina*	 Australia
 Austria	 Azerbaijan*	 Belgium
 Brazil*	 Bulgaria*	 Canada
 Chile	 Colombia*	 Croatia*
 Czech Republic	 Denmark	 Finland
 Dubai (UAE)*	 Estonia	 Greece
 France	 Germany*	 Iceland
 Hong Kong-China*	 Hungary	 Israel
 Indonesia*	 Ireland	 Jordan*
 Italy	 Japan	 Kyrgyz Republic*
 Kazakhstan*	 Korea	 Lithuania*
 Latvia*	 Liechtenstein*	 Mexico
 Luxembourg	 Macao-China*	 Netherlands
 New Zealand	 Montenegro*	 Panama*
 Peru*	 Norway	 Portugal
 Qatar*	 Poland	 Russian Federation*
 Serbia*	 Romania*	 Singapore*
 Slovak Republic	 Shanghai-China*	 Spain
 Sweden	 Slovenia	 Chinese Taipei*
 Thailand*	 Switzerland	 Tunisia*
 Turkey	 Trinidad and Tobago*	 United States
 Uruguay*	 United Kingdom	

* non-OECD countries and economies

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www.educationcounts.govt.nz/goto/pisa